RAILROAD GAZETTE

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NEW

New York Central & Hudson River Railroad Co.

Grand Central Depot.

H. Walter Webb,
Third Vice-President.

New York, September 26, 1892.

Mr. Royal C. Vilas, President New York Air Brake Co.,
115 Broadway, New York.

DEAR SIR:

Replying to your letter of last week, I would state that a full and detailed report from Mr. Dudley on the tests recently made by us of your automatic quick-acting brakes will not be ready until some time in October.

I have, however, a preliminary report from Mr. Dudley, and also reports from Mr. Voorhees, our General Superintendent, and Mr. Buchanan, our Superintendent of Motive Power and Rolling Stock, both of whom were present at the tests.

The gist of these reports is that, from a practical operating standpoint, there is no difference between the operation of the Westinghouse air brakes and the air brakes of the New York Air Brake Co.; and the tests where the cars in the train were mixed, a portion being equipped with the brakes of one Company, and a portion with the other, showed as good results as when either brake was used separately.

We are satisfied that there are no practical objections to allowing the cars equipped with the New York Brake to be used in conjunction with those equipped with the Westinghouse Brake.

I have, therefore, issued orders removing all restrictions as to the use of cars equipped with your brakes; and, hereafter, cars so equipped will be received and operated by this Company and treated precisely the same as the cars equipped with the Westinghouse Brake.

Yours very truly,

H. WALTER WEBB, *Third Vice-President.*

NEW YORK AIR BRAKE CO.,

115 BROADWAY, NEW YORK.

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RAILROAD GAZETTE DIRECTORY OF CLASSIFIED ADVERTISEMENTS.

Air Brake Fittings
Stanley G. Flagg & Co., Phila.
Air Brake Hose
N.Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Air Brake Regulator
Mason Regulator Co., Boston.
Air Compressors & Rock Drills
Ingersoll-Sergeant Rock Drill Co., 10 Park Place, N. Y.
Rand Drill Co., 23 Park Place, N. Y.
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Thomas Appleton, 505 Rialto Bldg., Chic.
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Louisville Steam Forge Co., Louisv., Ky.
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Boiler Plate
Schoenberger & Co., Pittsburgh, Pa.
Wellman Iron & Steel Co ,Thurlow, Pa.
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Acme Machinery Co., Cleveland, O.
Howard Iron Works, Buffalo, N. Y.
Bolts & Nuts
Fuller Bros. & Co., 139 Gr'nwich St., N.Y.
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Nat. Hollow Brake Beam Co., Chic., Ill.
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Schoen Mfg. Co., Pittsburgh.
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New York Air Brake Co., 115 B'way, N.Y.
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Edge Moor BridgeWks, Wilmington, Del.
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St. Charles Car Co., St. Charles, Mo.
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Reginald Canning & Co., 115 B'way, N.Y.
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Auto. Interchangeable Car Coupler Co., San Francisco, Cal.
Buckeye Aut.Car Coup.Co., Columbus, O.
Drexel Car Coupler Co., Rookery, Chic.
Gould Coupler Co., Buffalo, N. Y.
Hinson Car Coupler Co., Chicago, Ill.
Johnston Car Coupling Co., Phila., Pa.
McConway & Torley Co., Pittsburgh, Pa.
McGill Iron Works Co., Peoria, Ill.
Pratt & Letchworth, Buffalo, N. Y.
St. Louis Car Coupler Co., St. Louis, Mo
Smillie Coupler & Mfg. Co., Newark, N.J.
Trojan Car Coupler Co., Troy, N. Y.
Van Dorston Coup. Co., Phila., Pa.
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Railroad Lighting & Mfg. Co., Phila., Pa.
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Car Machinery
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Car Replacers
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American Steel Wheel Co., N. Y. City.
Baltimore Car-Wheel Co., Balto., Md.
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Boies Steel Wheel Co , Scranton, Pa.
Bowler & Co., Cleveland.
Davenport & Fairbairn Erie, Pa
C. G. Eckstein & Co., 41 John St., N.Y.
Jersey City Wheel Fd'y & Mach. Works,
Lima Machine Works, Lima, O.
Lobdell Car-Wheel Co., Wilmington, Del.
N. Y. Car Wheel Works, Buffalo.
Thos. Prosser & Son, 15 Gold street, N.Y.
RamapoWheel& F'dryCo., Ramapo, N.Y.
Stand. Steel W'ks, 220 So. 4th St., Phila.
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Washburn Car-WheelCo., Hartf'd, Conn.
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A. Whitney & Sons, Phila., Pa.
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Bush Cattle Guard Co., Kalamazoo, Mich.
Kalamazoo (Mich.) R.R. Veloc. & Car Co.
Merrill-Stevens Mfg. Co., Niles, Mich.
Wolhaupter, Benj., 39-43 Washington St., Chicago, Ill.
Chemists
Pittsb. Testing Laboratory, Pittsb., Pa.
Coal Chute
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D. L. Barnes, The Rookery, Chicago.
J. J. R. Croes, 13 William St., N. Y.
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Geo. L. Fowler, 53 Broadway, N. Y.
Albert Lucius, 71 Broadway, N. Y.
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Contractor
Mairs & Lewis, 18 B'way, N. Y.
Contractors' Cars
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Conveyors
Link Belt Eng. Co., Nicetown, Phila.
Copper
Hendricks Bros., 49 Cliff street, N. Y.
Cordage
Samson Cordage Works, Boston, Mass.
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Thos. Carlin's Sons, Allegheny, Pa.
Industrial Works, Bay City, Mich,
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Creo. Lumber & Con. Co. Fernandina, Fla.
Lehigh Valley Creo. W'ks, P. Amboy, N.J.
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Fontaine Crossing Co., Detroit, Mich.
Crossing Gates
Bogue & Mills Mfg. Co., Chicago.
Graham Pneumatic Gate Co., Chic., Ill.
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American Steel Wheel Co., N. Y. City.
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Hinson Drawbar Attach. Co., Chicago.
Dredging Machinery
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San Francisco Bridge Co., California.
Vulcan Iron Works, Chicago
Vulcan Iron Works, Toledo.
Drop Forgings
Billings & Spencer Co., Hartford, Conn.
Electric Headlights
Nat. Elect. Headlight Co., Indianapolis.
Electrical Contractors
H. Ward Leonard & Co., New York.
Elevators
Link Belt Eng. Co., Nicetown, Phila.
Otis Brothers & Co., 38 Park Row, N.Y.C.
Emery Wheels
N.Y. Belt. & Pack.Co., Ltd., 15 Park Row.
Northampton Emery W.Co., Leeds, Mass.
Springf'ld Em'y Wh'l Co , Bridgep't, Ct
Tanite Co., Stroudsburg, Pa.
Engineering Employment Bureau
Engineer, Employm't Bureau, 8 Granger Block, Syracuse, N. Y.
National Agency, Phila., Pa.
Engineering Instruments
Chas. H. Brightly, Philadelphia, Pa.
Heller & Brightly Philadelphia, Pa.
C. F. Ketcham & Co., 27 Nassau St., N. Y.
Keuffel & Esser, New York City
Queen & Co., Philadelphia Pa.
Young & Sons, Philadelphia, Pa.
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S. W. Frescoln, World Bldg., N. Y.
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Albert Lucius, 71 Broadway, N. Y.
W. B. Parsons, 35 Broadway, N. Y.
Chas. Paine & Sons, 71 Broadway, N. Y.
Pittsb. Test. Laboratory, Pittsb., Pa.
F. H. Smith, 227 E.German St., Balto. Md.
E. N. K. Talcott, 57 Broadway, N. Y.
Von Schon & Garrer, Fredericksb., Va.
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Wilson Bros. & Co., Philadelphia, Pa.
Westinghouse, Church, Kerr & Co., 620 Atlantic Ave., Boston.
Engines
Thos. Carlin's Sons, Allegheny, Pa.
Fishkill Landing Mch. Co., Fishkill, N.Y.
Westinghouse, Church, Kerr & Co., 620 Atlantic Ave., Boston.
Excavators
Bucyrus (O.) Steam Shovel & Dredge Co.
Industrial Works, Bay City, Mich.
A. S. Males & Co., Cincinnati, O.
Marion Steam Shovel Co., Marion, O.
Osgood Dredge Company, Albany, N. Y.
J. Souther & Co., Boston, Mass.
Vulcan Iron Works, Chicago.
Vulcan Iron Works, Toledo.
Explosives
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Feed-Water Purifier
Field Water Purifier Co., Chicago.
Arthur Fennell, Kansas City, Mo.
Fences
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Western Fence Co., Chicago, Ill.
Flexible Shafting
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
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Amer. Fluoride Co., 126 Liberty St., N.Y
Freight Cars, Second Hand
New York Equip. Co., 15 Wall St., N. Y.
Freight Conveyors
Industrial Works, Bay City, Mich.
Forges
The Foos Mfg. Co., Springfield, O.
Furnaces
Abendroth & Root M.Co., 28 Cliff St., N.Y.
Frogs and Crossings
Allentown Rolling Mill, Allentown, Pa.
Cleveland (O.) Frog & Crossing Co.
Elliot Frog & Sw. Co., E. St. Louis, Ill.
Johnston R. R. Frog & Switch Co., Phila.
Pennsylvania Steel Co., Steelton, Pa.
Ramapo Iron Works, Hillburn, N. Y.
Union Switch & Signal Co., Pittsburgh.
Weir Frog Co., Cincinnati, O.
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Ashcroft Mfg. Co., 111 Liberty St., N.Y
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F. C. Austin Mfg. Co., Chicago, Ill
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Guarantee Co. of N. A., Montreal.
Hand Cars
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Hand Power Works
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Cayuta Wheel & Foundry Co., Sayre, Pa.
Cushion Car Wheel Co., Indianapolis.
Highway Crossing Signals
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Hoisting & Conveying Machinery
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King Bridge Co , Cleveland, O.
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Hoisting Engines
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Industrial Works, Bay City, Mich.
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J. S. Mundy, Newark, N. J.
Vulcan Iron Works, Chicago.
Hollow Stay Bolt Iron
Falls Hollow Stay Bolt Co., Cuyahoga Falls, O.
Hydraulic Jacks
Richard Dudgeon, 24 Columbia St., N. Y.
Joseph F. McCoy Co., 25 Warren St., N.Y.
Watson & Stillman, 210 E. 43d St., N. Y.
Hydraulic Machinery
Union Iron Works, San Francisco.
Watson & Stillman, N. Y. City.
R. D. Wood & Co., Philadelphia, Pa.
Industrial Railways
C. W. Hunt, New York City.

RAILROAD GAZETTE DIRECTORY CLASSIFIED ADVERTISEMENTS

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Nathan Mfg. Co., 94 Liberty street, N. Y.
Wm. Sellers & Co., Philadelphia.
Inspectors
Pittsb. Test. Laboratory, Pittsb., Pa.
Inspectors of Bridges and Ry. Equipment
R. W. Hildreth & Co., 2 Wall St., N. Y.
Insurance
Hart. S. Boiler Insp. & Ins. Co., Hartford.
Interlocking Switches & Signals
Allentown Rolling Mills, Allentown, Pa.
Hall Signal Co., 30 B'way, N. Y.
Johnson R. R. Sig. Co., Rahway, N. J.
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Union Switch & Signal Co., Pittsburgh
Wharton R. R. Switch Co., Phila.
Iron—Taylor Yorkshire
S. M. Jones & Co., Boston, Mass.
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King Bridge Co., Cleveland, O.
Jacks
Fairbanks, Morse & Co., Chicago.
McSherry Mfg. Co., Dayton, O.
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D. A. Hopkins Mfg. Co., 143 Liberty St., N. Y.
Phosphor Bronze Smelting Co., Philada.
Paul S. Reeves, Philadelphia, Pa.
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Link Belt Eng. Co., Nicetown, Phila.
Lock Washers
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Brooks Locomotive W'ks, Dunkirk, N. Y.
Cooke Loco. & Mach. Co., Paterson, N. J.
Dickson Mfg. Co., Scranton, Pa.
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Lima Machine Works, Lima, O.
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Pittsburgh Loco. & Car W'ks, Pittsburgh.
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Portland Co., Portland, Me.
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Rogers Loc. & Mach. Wks., Paterson, N. J.
Schenectady (N. Y.) Loco. Works.
Taite & Carlton, London, Eng.
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Locomotive Ash Pans
Geo. L. Fowler, 53 B'way, N. Y.
Locomotive Boiler Tubes.
Allison Mfg. Co., Philadelphia, Pa.
Locomotive Finishing Varnish
Flood & Conklin, Newark, N. J.
Locomotive Headlights
Adams & Westlake Co., Chicago.
Nat. Electr. Headlight Co., Indianapolis.
Locomotives (Mining
C. W. Hunt, New York City.
Locomotives, Second-Hand
Reginald Canning & Co., 115 B'way, N. Y.
Thos. Carlin's Sons, Allegheny, Pa.
A. S. Males & Co., Cincinnati, O.
N. Y. Equipment Co., 15 Wall St., N. Y.
Locomotive Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
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Detroit Lubricator Co., Detroit, Mich.
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Acme Machy. Co., Cleveland, O.
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Billings & Spencer Co., Hartford, Conn.
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Hayes Tool Co., Portland, Me.
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Jarecki Mfg. Co., Erie Pa.
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Niles Tool Works, Hamilton, O
Pedrick & Ayer, Philadelphia, Pa.
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D. Saunders' Sons, Yonkers, N. Y.
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Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
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Universal Radial Drill Co., Cincinnati,
Watson & Stillman, 210 E. 43d St., N. Y.
Wharton R. R. Switch Co., Phila.
Malleable Iron Castings.
National Mall. Castings Co., Cleveland.
Mandrel Rolled Staybolt Iron
Falls Hollow Staybolt Co., Cuyahoga Falls, O.
Mining Machinery
Thos. Carlin's Sons, Allegheny, Pa.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Union Iron Works, San Francisco.
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Amer. Washer & Mfg. Co., Newark, N. J.
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Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark.
Positive Lock Wash. Co., Newark, N. J.
Ruffner & Dunn, Philadelphia, Pa.
Young Nut Lock, N. Y.
Oil
Signal Oil Works, Ltd., Franklin, Pa.
Oil Cans
Adams & Westlake Co., Chicago.
Ore Handling Machinery.
Lidgerwood Mfg. Co., 96 Lib'ty St., N. Y.
Packing, Metallic
Columbian Metal Rod Pack. Co., Phila.
U. S. Metallic Packing Co., Phila.
Packing, Rubber
N. Y. Belt. & Pack. Co., Ltd., 15 Park Row.
Paint
Canton Stee Roofing Co., Canton, O.
F. W. Devoe & Co., Fulton St., N. Y.
Jos. Dixon Crucible Co., Jersey City, N. J.
Nat. Paint Works, Williamsport, Pa.
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W. Dudley & Co., Washington, D. C.
S. C. Fitzgerald, Washington, D. C.
Howson & Howson, 119 So 4th St., Phila
Geo. P. Whittlesey, Washington, D. C.
Phosphor-Bronze
Paul S. Reeves, Philadelphia.
Phosphor-Bronze Smelting Co., Phila.
Pianos
John Church Co., Cincinnati, O.
Pile Drivers
Bucyrus (O.) Steam Shovel & Dredge Co.
Thos. Carlin's Sons, Allegheny, Pa
Industrial Works, Bay City, Mich.
Lidgerwood Mfg. Co., 96 Liberty St., N. Y.
Vulcan Iron Works, Chicago, Ill.
Pipe Cutting & Threading Mach.
D. Saunders' Sons, Yonkers, N. Y.
Pneumatic Foundations
S. W. Frescoln, World Bldg., N. Y.
Portable Drills
Jas. T. Halsey, Philadelphia, Pa.
Stow Flexible Shaft Co., Phila., Pa.
Stow Mfg. Co., Binghamton, N. Y.
Pressed Steel
Schoen Mfg. Co., Pittsburgh, Pa.
Publications
Colliery Engineer, Scranton, Pa.
Engineering Magazine Co. World Bldg., N. Y. City.
Poor's Manual, N. Y.
Pulleys
J. H. & D. Lake Co., Hornellsville, N. Y.
Pumps
Thos. Carlin's Sons, Allegheny, Pa.
Fairbanks, Morse & Co., Chicago.
Goulds Mfg. Co., Seneca Falls, N. Y.
Laidlaw & Dunn Co., Cincinnati, O.
Pulsometer S. P. Co., 120 Liberty St., N. Y.
R. D. Wood & Co., Philadelphia, Pa.
R. R. Worthington, 96 Liberty St., N. Y.
Radial Taps
J. T. Connelly, Milton, Pa.
Rails
Bethlehem Iron Co., 80 Broadway, N. Y.
Cambria Iron Co., Johnstown, Pa.
Geo. A. Evans, 40 and 42 Wall St., N. Y.
Humphreys & Sayce, 10 Wall St., N. Y.
Illinois Steel Co., Chicago, Ill.
A. S. Males & Co., Cincinnati.
N. Y. Equipment Co., 15 Wall St., N. Y.
Pennsylvania Steel Co., 2 Wall St., N. Y.
Robinson & Orr, Pittsburgh Pa.
Rail Fastenings
Cambria Iron Co., Johnstown, Pa.
Fisher Rail-Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
Metcalf, Paul & Co., Pittsburgh, Pa.
National Lock Washer Co., Newark, N. J.
N. Y. Equipment Co., 15 Wall St., N. Y.
Morris Sellers & Co., Chicago.
Ruffner & Dunn, Philadelphia, Pa.
Rail Joints
Cont. Rail Joint Co. of Amer., New'k, N. J
Eno Rail Joint Co., Newark, N. J.
Fisher Rail Joint Works, Trenton, N. J.
A. S. Males & Co., Cincinnati, O.
McConway & Torley Co., Pittsburgh, Pa.
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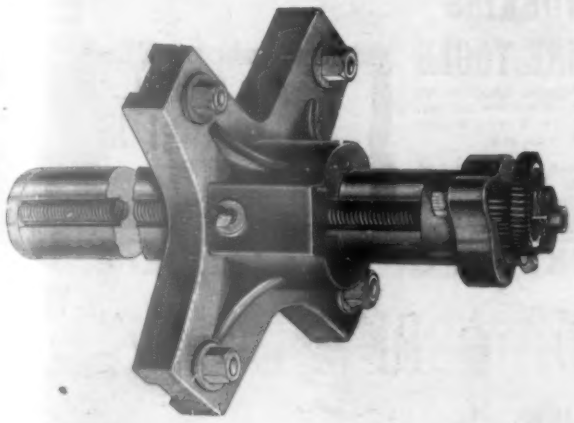

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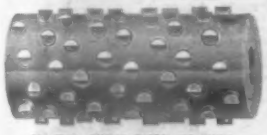

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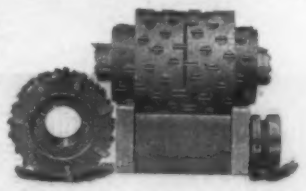

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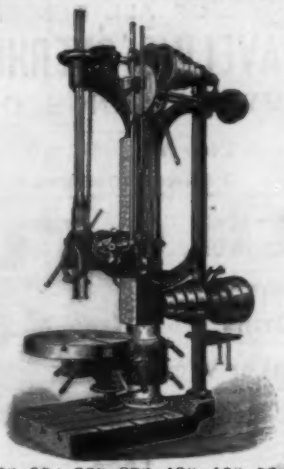

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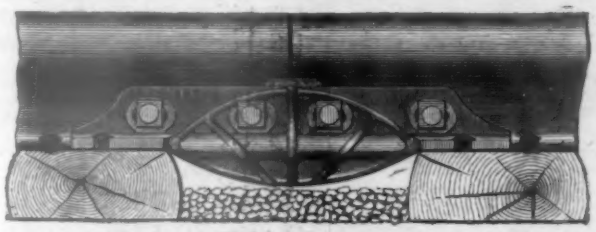

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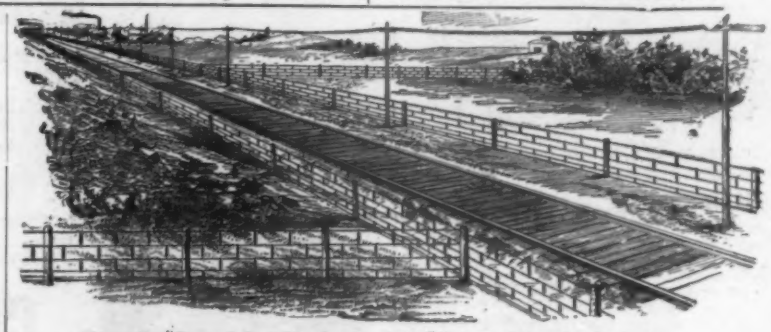

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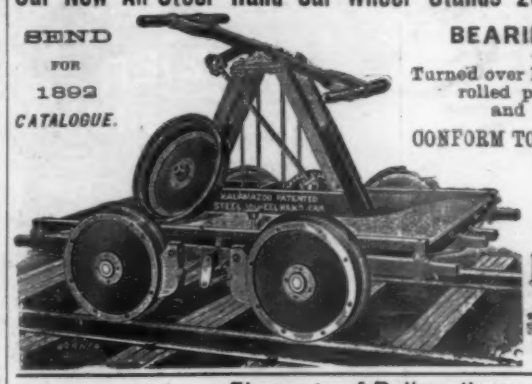

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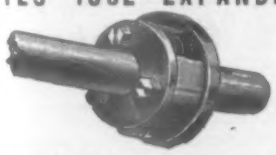

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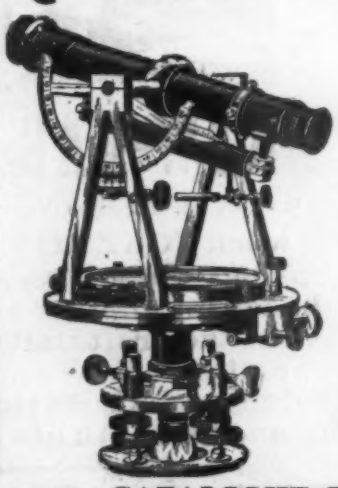

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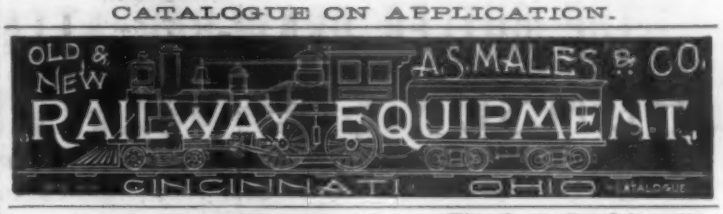

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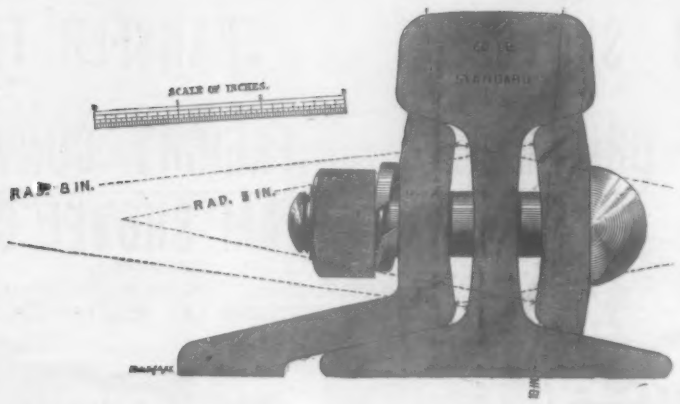

PATENTED
February 4, 1868.
April 28, 1869.
September 28, 1869.
March 21, 1876.
September 15, 1885.

THE VERONA NUT LOCK was first introduced to the railway public in 1875, seventeen years ago. It at once commended itself to railway managers, engineers and track masters as a remarkably simple and effective device for taking up the wear due to imperfect contact and abrasion of rail and splice, and for its positive action in locking the nut. That it continues to be highly regarded for the purposes named is shown by the sales of 1892, which up to date exceed *thirteen millions*, making the grand aggregate of sales fully

TWO HUNDRED MILLIONS.

This vast number has equipped more than 140,000 miles of track, and has required in its manufacture more than twelve million pounds or 6,000 tons of steel. Nearly every railroad in the country has used it to a greater or less extent at one time or another, while many of the best equipped roads of the country have maintained it as a standard from the time it was first brought to their notice up to the present. It has been modified in minor points from time to time, but in its general features and in its simplicity and effectiveness

IT CANNOT BE IMPROVED UPON.

The attempt to do so merely emphasizes by contrast its superiority to the various overloaded imitations of this originally perfect device.

Its use more than repays its cost in prevention of low joints and battered rail ends, while

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And point to its value in the maintenance of a perfect and noiseless track.

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RAILROAD GAZETTE

FRIDAY, NOV. 11, 1892.

CONTENTS.

Contributions.

Turning Ties.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I wish you would call the attention of the Roadmasters at their coming convention to the question which I often hear discussed of the wisdom of turning ties in the track. Does it pay? I am inclined to think that it seldom does. By the time that the top of the tie has become so decayed, spike-killed or worn that it is no longer useful, there will not be life enough left in the bottom of it to pay for turning it over; that is, you will have to expend as much work on it in getting it into place as you would on a new tie, while the remaining life of it will be very short.

Of course I know that this question, like most others, has at least two sides. There are doubtless circumstances in which it may pay to turn a tie over. Take for instance a stone ballasted road with very heavy traffic; there the top of the tie will be worn out long before the wood begins to get dozy. In such case it might be worth while to turn it over; but with unballasted track or track where the drainage is not perfect, and where the traffic is light. I don't believe that it would be worth while to turn ties. ROADMASTER.

Railroad Office Troubles.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Since the march of the typewriter has improved our handwriting by abolishing it, many hours that would have been spent in deciphering the unreadable are more profitably employed, and it is only occasionally that the expert in handwriting is called into play, and then only to decipher a signature.

The signatures themselves, it would seem, are becoming a little plainer, although, perhaps, this is only an apparent improvement due to the fact that we have more time to devote to them. Of course to decipher a signature does not need such an expert as was required in the old times to decipher a letter, for every signature has a title which is usually typewritten, and with this as a starting point and the Official Guide as an index, it is quite easy to decipher almost any signature. If only the custom of signing with a rubber stamp should become as prevalent as the use of the typewriter, and if railroad officers would only consent to have the stamp maker improve on some of their idiosyncrasies of chirography, office work in a railroad would be a much easier task, compared with what it was ten years ago. Indeed, if, with the assistance of our modern improvements, we should adopt the standard of William Longsword, we could do without learning to write altogether, and save other people trouble as well as ourselves.

There are still left, however, in some of the railroads' real estate offices specimens of the fine old conveyancers of the early part of the century who are holding out against the typewriter; but as their handwriting, and that of their clerks, is fully as plain and compact as that of the machine, we can hardly complain. There is much to be thankful for in the fact that almost all of the legal departments have adopted the typewriter.

We are not, however, entirely free from trials. The batches of correspondence received from some backwoods offices are absolutely dangerous from the number of pins which are used to fasten them together. These pins even burst through the outside envelopes in which the correspondence is forwarded, so that office boys warn each other against the too familiar handling of the porcupine-like envelopes from such and such an office. When the envelope is opened, with the help of a long paper knife, the correspondence is somewhat less dangerous, as the pins are usually located along the upper margin; but they are not confined to any particular corner and the pin points protrude in all directions. A gifted passenger agent once strove to be the benefactor of the railroads by issuing simple instructions as to the insertion of pins in correspondence, but his rules of procedure are entirely slighted by the porcupine offices. I have counted 15 pins in one batch received from one of these offices which was made up of only 11 pieces of paper.

In the matter of referring papers, there has been a marked improvement in the last few years. Most self-respecting offices are governed by the rule that in general papers may be referred down but not referred up. None of us complain if the president sends our office a lot of papers, but when our office asks a superintendent's or a roadmaster's office for information, and receives 10 or 20 separate pieces of paper of all sizes, skewered on a paper fastener, conveying contradictory information, and ending "please note explanation," it is enough to make the judicious grieve. It may be urged that the office mean enough to refer up such an indigestible mass of information must be incapable of sifting the truth from it, but this is small comfort to the man who must base immediate action upon such correspondence, and still less to his clerk, who must make him an "abstract" of it. A variety of this nuisance is the office which refers private, if not personal, information to parties who have no right to that information, or, at least, to whom it should be conveyed in a modified form. But this is really only a want of tact, and tact will always be a rare quality.

I do not wish to be invidious, but I rather think that the bureau of the traffic department which takes care of the freight claims gets together the most ill-assorted lots of correspondence. Statements of billing, original billings, shippers' receipts, bills of lading, agents' traces, traces from the car accountant, claims from shippers, explanations from agents and explanations from superintendents, are wrapped in a thick reference wrapper, interlarded with "please note" and "please note and advise," and, finally, joined together by one of those huge pins which are manufactured especially for claim agents. Of course there is a great deal of convenience in keeping all the members of a varied correspondence together, but it makes the "R. R. R." letter bags very heavy, and warms our hearts toward the old railroader who was not fond of office work and who never filed anything. He used to refer all his correspondence and never asked for a reply.

There are some offices which make nuisances of themselves by referring questions to you which are not in any way your business, but which necessitate a good deal of trouble in the way of explanation. But perhaps the hardest office to deal with is the one which is continually bringing up the same point over and over again, no matter how many times it has been explained. There is, sad to say, no prospect of any entire relief from burdens of this kind. Our handwriting has been reformed by machinery, but we should be chary about hankering for more machines; no new invention can be more mechanical than offices like these. G. F. J.

A Maintenance of Way Question.

BY AN ENGINEER OF MAINTENANCE OF WAY.

The Difficulty.—The assertion has been made that there has been but little improvement in the condition of tracks during the past twenty-five years compared with the marked improvement made in the rolling stock, train service, signal devices, etc., and, in fact, in every other branch of the great transportation industry, whose mileage now aggregates in the United States about 220,000 miles of track, including second, third and fourth track and sidings, or equal to an eight-track railroad around our globe.* Why is it? I propose to discuss this purely from the labor standpoint (though there are other causes), for I consider it the most important and the easiest to remedy. By the latest statistics of the Interstate Commerce Commission there were, at the end of June, 1890, the following numbers of men employed in the maintenance of way:

Carpenters	37,936
Section foremen	27,129
Other trackmen	157,036
Total	222,101

To these I should add at least 8,000 masons probably included by the Commission in some other group, making, say 230,000, men employed directly in maintenance of track. The grand total of officers and employés, by the same authority, is 749,301. So over 30 per cent. of all the force employed on the railroads of the country is employed directly on permanent way. In the analysis of operating expenses the Commission charges to each group the following percentages of the total:

	Per cent.
Maintenance of way and structures	22.06
Maintenance of equipment	16.48
Conducting transportation	51.18
General expenses	10.15
Unclassified	0.13
Total	100.00

Consider how much of the cost of maintenance is material and how little material goes into conducting transportation and general expenses; consider further that while the 30 per cent. of all those employed are on track, but 22 per cent. of the operating expenses is charged to that department, and you will get some notion of the relatively low wages paid to the trackmen. As a matter of fact we know that men who do the actual track work rate no higher in their pay in their respective localities than the lowest class of imported foreign labor daily arriving at Castle Garden. So, at first glance, it would seem that something is radically wrong with the pay of the maintenance of way force. It will be answered, "Be that as it may, when your track foreman is competent, almost any laborer can by time be made to answer just as well as more skilled laborers."

Granted, for sake of argument, but who, pray, is your track foreman? Where does he come from? Who make up this army 230,000 strong; these picked men, handy with tools, jack-of-all-trades, carpenter, machinist, mason; this leader of men. Whose careful eye is to line and surface these 220,000 miles of steel tracks, detect broken rails, remove dangerous rocks and trees from the hillsides overhanging this great highway, ferret out hidden slips in the embankment, undermined piers and abutments, broken frogs and switches, pass judgment on the safety of the permanent way? Whose watchful eye must detect unspiked ties and rails, unlocked switches, unlighted lamps, must get skilled labor and a full day's work out of his gang of unskilled and ill-paid labor? It requires the perception and endurance of no ordinary man to keep these unskilled laborers under his view from leaving defective pieces of work behind them—these 11 and 12 cents per hour men.

The foreman must see that economy is practiced in the use of material in renewals, and the working of his force; that the full life of every tie, rail, spike, bolt, splice, nut lock, switch, frog, shovel of ballast is obtained, and more if possible, before scrapping it. He must be an hydraulic engineer, keeping up the water supply, and landscape gardener; see that the slopes maintain their proper angle, and that ditches perform their duty. He must see that the road bed and station at all times presents a neat appearance, must clear wrecks and, during storms, stand outdoors at his post, and keep everything safe day and night, winter and summer. His eye must be skilled to line his tracks to the perfectness of the transit to keep curves in proper line and surface, and with the proper elevations given to them, to the nicety of an engineer's level. These duties are not exaggerated one iota; they are but a portion of his manifold requirements.

There are few first-class track foremen who fill the bill completely, but there are some, and most admirable ones too. A Division Superintendent with 100 miles of double track or more has probably a half dozen such men out of forty. In other words, 15 per cent. of his track is first class, and the remaining 85 per cent. varies from fair to bad, according to the track foreman. For with the best of material and the average track foreman, you have rough riding track. Your roadmaster does his best, the Superintendent and Division Engineer urge, another man or two is added to his force, a floating gang is added to "help him out," but a few months later the track is bad again. You tell the roadmaster and Supervisor to put a better man in his place, but the Supervisor says "I have no better man." This is not theory, it is a fact.

In other words, the track problem is now a matter of labor almost entirely; quality more than quantity, and I make the assertion that the railroad managers have wofully neglected this one branch of the great transportation problem. "How many men have you per mile of track?" is the extent of their inquiries, regardless of the kind of men. Here the inquiry ends, but the criticism does not cease. The division officer is raked over the coals, criticised, given another trial, possibly moved to another division, and another shining light given the task to handle. In the same manner the process goes on. Unfortunately every railroad manager thinks that, besides his own particular department (each one has been prominent in one or more of the departments, hence his promotion) he knows all about track. His occasional trip over the road in his private car enables him to see what is bad and good from the rear end, and his criticisms follow. It is unfortunate, that all railroad managers think they know all about tracks. One year the railroad manager says, "You can have one man to two miles of track; no ballast; 30,000 ties (where 100,000 are required) and no steel rail (30) tons are actually worn out). It is all you need, and all you will get," because he knows all about it.

But let us confine ourselves to the track foreman. His duties have been defined. He must come from the men he is foreman of. They are the lowest grade of labor in their respective localities. This is the problem which confronts us. In agricultural districts, away from manufacturing centres, good men are found, but in and near large cities and through manufacturing and mining districts, the track force suffers, and the tracks ditto. Let us leave the pay of the great bulk of the track force for the present and confine ourselves to the education and compensation of first-class track foremen, and see how it works out.

There are few apprentices, because the pay of the track foreman, the most elevated, is not over $60 per month; about the same pay as ordinary carpenters. The stock foreman should come from, naturally start on, this track

*By Poor's "Manual" the total track at the end of 1891 was 214,520 miles.

force, because nothing better offers, and they can easily find employment there. The work is hard; their associates, generally, the most ordinary class of men in the community; the bright young men, the ones foremen should be made from, enter other departments of the railroad, become firemen, freight train conductors, masons, or leave the service altogether to work for contractors who have picked men and pay them accordingly. The consequence is, the railroad company has to put up with a class of men other concerns won't employ, and out of this same class of men no one wants our foremen are made.

Only think of it, a great railroad corporation, embracing 600 miles of track, including sidings and branches, whose tonnage aggregates 100,000 tons daily, with 150 scheduled passenger trains, employing 1,200 track hands, 75 track foremen, and not one trackman could each head of a department recommend for promotion to foreman; in fact, foremen had to be imported from another section of the state 300 miles away, and of the 75 foremen, not 10 are what we would call first-class track foremen.

The Remedy.—How shall we remedy this?

1st. Class railroad track foremen as mechanics, as much so as machinists, masons, carpenters or any other tradesmen. 2d. Pay them as such. 3d. Apprentice them as other mechanics. Properly school up bright young men for track foremen on each roadmaster's or supervisor's divisions. Let there be one floating gang at least under the management of the best and most thorough and intelligent trackman on the division. Make his gang up of picked men, apprentices if you please; bright young men, mostly American born, and there are thousands of them. Grade the pay of this force per man according to his length of service and ability. Give the foreman first-class wages, $75 to $100 a month. Grade his gang from $2.50 a day down to $1, or even lower for the apprentices.

This gang would do principally switch and general work, such as all floating gangs do, renewals of material where required, assisting with general track work where necessary, and without costing the railroad company much additional expense for such gang, which nearly all divisions have now employed. At the same time you would be getting material for first-class trackmen.

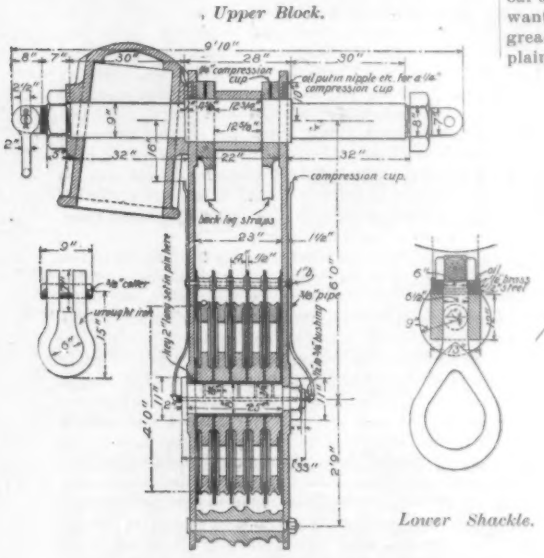
In addition to this I would grade the track force on each section foreman's gang. 1st. Make the pay of the foreman such as to induce good men to look for such positions. 2d. Give him a good house to live in at a nominal rent. 3d. Make one assistant foreman or first laborer. Pay such a man 30 cents at least per day more than the others in his gang; the rest of the gang to be graded according to circumstances, the surrounding country, and difficulty experienced in getting good men, etc. House all the regular track forces in good, plain, neat houses adjacent to the foreman's.

The last is a most important feature. Aside from the advantage it is to the railroad company to have its men within call, many hours would often be saved in opening traffic, were the men at hand, and it does not take half the night to hunt these scattered laborers living in the outskirts of the towns. But you could then get better men; you could pick them. Now we take what comes; then you would have a more permanent force. Besides, the increase in the pay of trackmen could be brought about by giving them cheap rents. Rent a men a $1,000 house for $60 a year, which would pay repairs and four per cent. interest. The same house now costs him from a regular town renter $120, or $5 increase a month, or 20 cents a day. Your trackmen would then be receiving in reality $1.50 a day, instead of $1.30, which is the poorest paid labor in the district of the writer. Besides, I contend that with an increase in the pay of the track force, sufficient to get first class men, the better paid men would do more and better work, and less men per mile would be needed at less aggregate cost. In other words, by carrying out the plan, you would get better track for the same or less cost.

In the community of the writer, the track force is now mostly foreign born, freshly imported. They "speakie no English." You want a claw bar, and you take up a claw bar and make a few motions, and the man knows you want one, and so for each kind of tool. There are a great many gangs made up of this class of men. It is plain to see the difficulty our track foreman labors under with such hands. He hardly feels safe to send one of them to flag approaching trains but this he is compelled to do. Ten first-class laborers at $1.50 a day, $15, are worth 20 such men at $1.30, costing $26. Do you think track foremen can be made out of such material?

The writer spent the first six years of his railroad work on a division of one of our great trunk lines in the vicinity of New York, where labor was plenty, on account of the large floating population adjacent to the metropolis, augmented almost daily by large numbers of emigrants arriving at Castle Garden, many of whom first try locating within 50 miles of the New York harbor before trying their fortune in the great West. And although many of the track laborers were fresh from the Emerald Isle, they readily worked into good trackmen, possibly had been employed as such in their mother country. Be that as it may, with careful application and close association with the different track gangs on the 30 miles of track under his supervision, selecting foremen and assistant foremen himself, after noticing the leaders, and becoming acquainted with them in daily intercourse, and trying their worth in selecting them for specific kinds of work, he was enabled to get 15 first-class track foremen; always having six or more good men in reserve to fill vacancies, or to recommend to other divisions when called upon. The men appreciated this, knowing that their promotion was in their hands. He will admit, however, that this could be accomplished there, for the reason that there was a large floating force to be drawn upon for the reasons named. Besides, labor did not demand higher wages than what his road paid in the country adjacent. The result was his track was conspicuous for its perfection in general railroad circles. His promotion followed to a more important position as Division Engineer on another division. But the reputation gained in the vicinity of New York is fast waning, though his efforts have been a hundred fold greater where he now is.

The subject is worth serious consideration. Large sums are annually expended experimenting with different patterns of rails and joints, tie plates, rail fastenings, etc. Had the managers spent half as much in obtaining a better class of trackmen, there would be far better tracks to-day, and larger dividends on many of the roads. Look for one moment at the locomotive engineers. As a class, I consider they have no equal in the country; well to do, even tempered, conscientious, industrious, reliable, well satisfied, competent, sober men. Their responsibility is great, and they fill the bill to perfection. They are just what they should be. The reasons are known; they are well paid, they are schooled up for the position, and their services are appreciated and command the respect of their employers, and they are an element of strength and respect in their communities. Imagine the condition of affairs if a Division Superintendent ran short of locomotive engineers, and had no men to fill vacancies or make extra trips. It is about the condition we are in many places about track foremen. Further argument is useless, it is cumulative.



EIGHTY-TON SHEERS OF THE GLOBE IRON WORKS, CLEVELAND, OHIO.

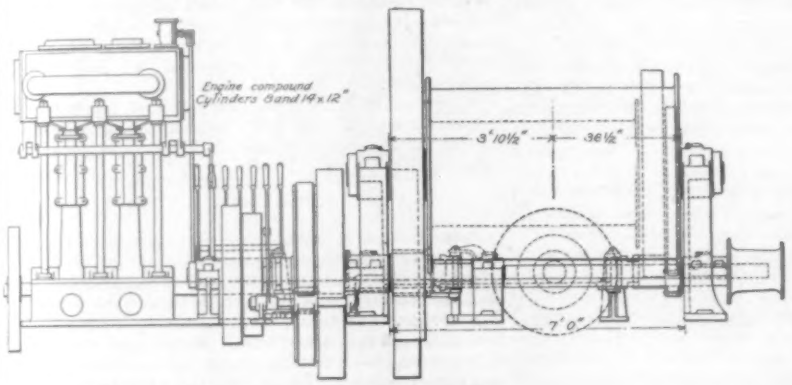
Eighty Ton Sheers, Globe Iron Works, Cleveland.

The rapid increase in the size of the ships built on the lakes and the corresponding increase in the weight of engines and boilers have made the introduction of improved facilities for handling heavy machinery almost obligatory. To meet the demands upon them in this regard, the Globe Iron Works Co., of Cleveland, has built and erected in its shipyard a set of sheers which

we illustrate in this issue. These shears are nominally of 80 tons capacity but are fully able to handle 100 tons if necessary.

The front legs are 100 ft. 5 in. long from centre to centre of pins and are 26 ft. apart at the feet. The back leg, which is 130 ft. 6 in. long between centres, is connected to a screw at its lower end, by which the foot can be moved 40 ft. and the moving block 49 ft., horizonally. The motive power for these sheers consists of a vertical compound engine which has cylinders 8 and 14 in. in diameter by 12 in. stroke. The engine is connected by spur gearing, as shown in the illustration, to a main hoisting drum 48 in. in diameter and to a smaller drum 30 in. in diameter for light work, and also by bevel gearing to the screw by which horizontal motion is obtained. The large drum is grooved to receive the hoisting rope, which is a 19-strand, steel wire cable, 1⅝ in. in diameter. There are five sheaves in the upper block, one of them being an extra sheave for light hoist, and four in the lower block, making eight running parts of the cable. There are two changes of speed in the gearing, which give a speed of hoisting in the gearing with the large drum of 1 ft. 6 in. per minute at the slowest and 3 ft. at the fastest speed. With the same changes the speeds of horizontal motion of the back leg by means of the screw are 3 ft. and 6 ft.

The sheer legs are of steel and have a rectangular section, the two front legs being 36×44 in. in the middle and 20 in. square at the ends, while the back leg is 45×50 in. at the middle and 20 in. square at the ends. These legs are built up of ⅝ in. steel plates and angles, the joints having double butt straps and being triple riveted. The corners are connected by 4×4 in. angles,

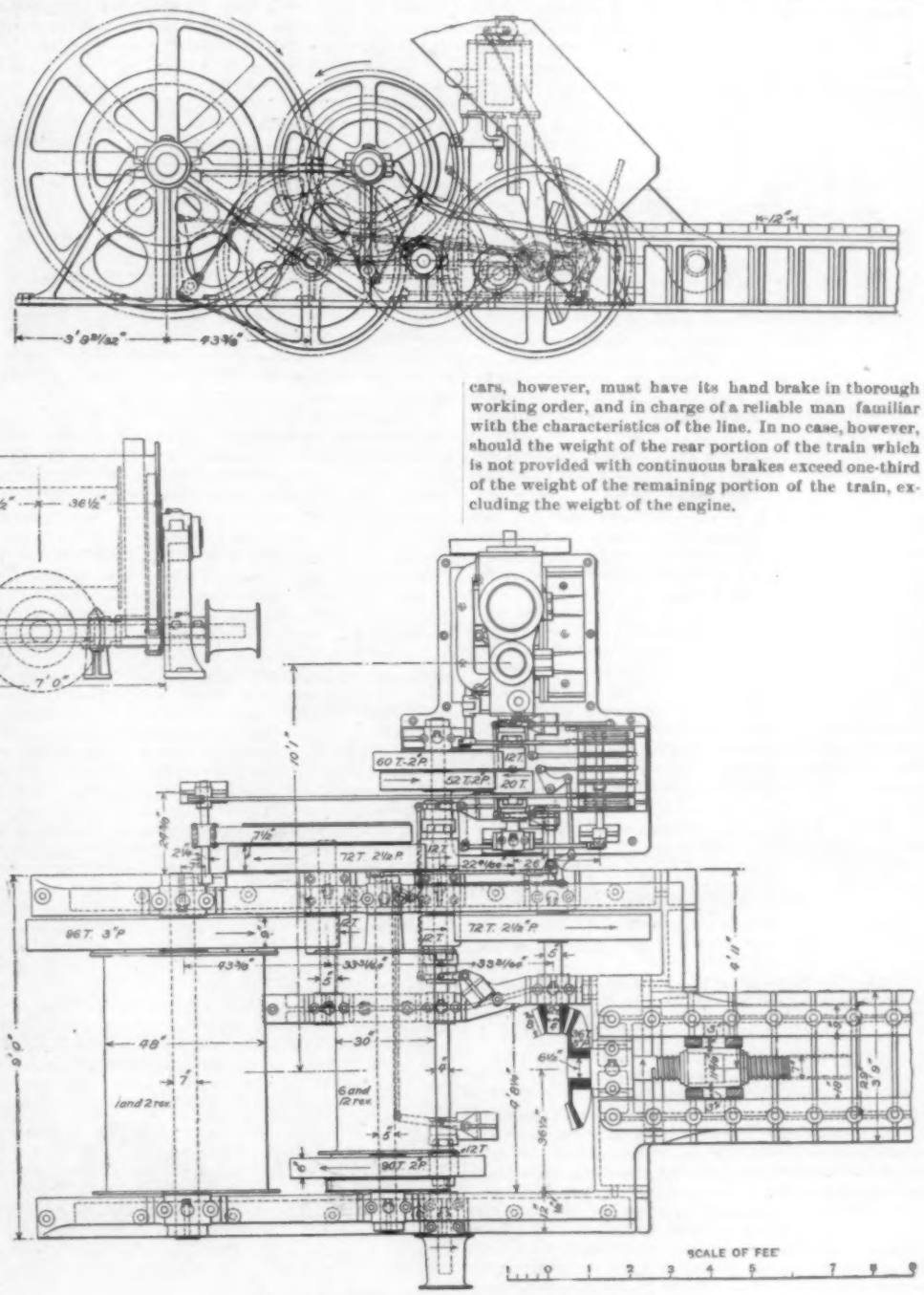


double riveted. At the ends of the legs the plating is doubled for a length of 12 ft., besides being stiffened the entire length with 3½×6 in. angles and tied across with plates 10 in. wide, at intervals of 10 ft. The top and bottom ends of the back leg have wrought iron straps bolted on the inside and are bolted 11 in. and 7 in. respectively to engage the pin at the upper end and the cross-head at the lower end. The front legs are capped at the top and bottom with cast iron caps and are bored through at the proper angle to receive the pins, which are 9 in. in diameter at the top and 7 in. at the bottom.

The details of the upper connections are shown in the engravings, with a section of the upper block. The pins at the feet of the front legs rest in pedestals formed in castings 6×8 ft. at the base, which rest on piles at the edge of the dock. This piling is proportioned to give a load of about 10 tons on each pile. Courses of heavy timbering bound in with heavy bolts are built into the piling forming a table for the pedestal castings and the piles themselves are joined with cross pieces lower down. The screw by which the horizontal movement is obtained is made of best forged scrap iron, is 7 in. in diameter, and is threaded for a length of 43 ft., with nine threads to the inch. The thrust is taken by a series of collars at the end of the screw. The foundation at the back of the sheers, which, of course, takes a large part of the load, consists of a solid block of concrete 12 ft. in cross section and 62 ft. long, which is built up on 12 by 12 in. oak stringers and oak cross pieces of the same cross section bolted down to the stringers. The holding down bolts, as is clearly shown by the drawings, pass through the oak stringers just referred to.

The sheaves in the large blocks are of cast iron 48 in. in diameter, turned and grooved, and are bored and bushed with brass to fit the 8-in. pins. The details of the upper block and the swivel for the lower block are shown in our illustrations.

We are indebted for the drawings from which the illustrations are made, and for particulars of these sheers, to Mr. Walter Miller, Mechanical Engineer of the Globe Iron Works Co.



Plan and Elevations of Engine of Eighty-Ton Sheers.

Safety Regulations on Swiss Railroads.

As a means of insuring greater safety in the operation of Swiss railroads the Swiss Federal Council, on the recommendation of its railroad department, recently adopted the following regulations:

Article I.—1. Instead of dispatching trains at certain intervals of time they should be dispatched with reference to the intervening distances, and, in general, the distance between any two trains should be equivalent to the distance between two stations.

2. Where the arrangement of a time table necessitates running trains at less distances apart, the section between any two stations must be subdivided, and block stations must be established.

Article II.—1. Return signaling is obligatory. No train must leave a station before being assured that the train immediately ahead has reached or passed the next station. Such assurance is to be given by telegraph from the station in question.

2. Where, on a single-track line, two trains are going in the same direction, and a third train is going in the opposite direction in the space between them, the arrival of this last train at any point may be accepted as a return signal from the station ahead and no telegraphic signal need be given.

3. The Council reserves the right of permitting the use of the telephone instead of the telegraph to transmit these signals.

4. In all cases, whether the return signals are given by telephone or by telegraph, every precaution is to be taken to have the system conscientiously followed.

5. Where there is only one train on a line return signaling may be dispensed with.

6. The system of return signaling should be in operation on all roads by July 1. Where, for any reason, it has been impossible to comply with this order, extension of the time limit may be granted. Applications for such time extensions must be made within 20 days after the publication of these regulations.

Article III.—1. On all Swiss railroads all passenger and express trains must be provided with continuous, automatic air brakes.

2. Exceptions may be made in the case of trains on branch and local lines on which the maximum speed at no time exceeds 45 km. (28 miles) per hour. But even on these continuous automatic brakes are to be provided on passenger trains when the grades exceed 1.5 per cent., or where the road is not fenced in, or where there are no barriers at crossings, or where the road runs along public streets.

3. For the fast lines and the main lines connecting with other roads, the brake appliances should be of the Westinghouse type, so that other similarly working brakes may be used in conjunction with them. On roads with heavy grades, and where it may be found expedient, a duplicate brake tube system is to be provided.

4. On trains exceeding a speed maximum of 60 km. (37.3 miles) per hour, the continuous brake system must be carried through to the last car of each train. On other trains, also having continuous brakes, it is permitted to couple on three additional cars behind the last car fitted with the centinuous brakes. The last one of these three cars, however, must have its hand brake in thorough working order, and in charge of a reliable man familiar with the characteristics of the line. In no case, however, should the weight of the rear portion of the train which is not provided with continuous brakes exceed one-third of the weight of the remaining portion of the train, excluding the weight of the engine.

5. (*a*) All passenger train engines should admit of being included in a continuous brake system. In the case of tender locomotives, the tender at least should be included in the system. In the case of tank engines, the drivers should be under the control of the continuous brakes.

(*b*) All passenger, baggage and mail cars should be fitted up completely with brake appliances.

(*c*) In the case of freight cars a number not exceeding one-third of the total equipment need be provided only with brake tubing.

6. On the standard-gauge passenger cars, fitted with air brakes, provision is to be made both on the platforms and in the interior of the cars which will enable the brakes to be applied.

7. These regulations are to be complied with prior to July 1, 1894, it being assumed, however, that all possible haste will be made in conforming to them, and that on all fast trains automatic, continuous air brakes will be in use by June 1, 1892.

8. Railroad companies may apply for the granting of exceptions where special conditions warrant them.

Article IV.—1. Concerning rolling stock, it is to be

COMPARATIVE TESTS OF COMPOUND AND SIMPLE LOCOMOTIVES; MISSOURI, KANSAS AND TEXAS RAILWAY.

COMPOUND—NORTHBOUND TRIPS.

Reference number.	No. of cars handled. Load.	Empties.	Weight of train. Tons.	Time on road. H.	M.	Actual running time. H.	M.	Total coal used. Lbs.	Total water used. Lbs.	Tons hauled one mile per lb. coal.	Tons hauled one mile per lb. water.	Lbs. water evaporated per lb. coal.	Miles run per ton of coal.	Date of trip.
1	27	..	726.38	8	30	7	5	17,000	65,166	6.80	1.77	3.83	18.70	July 10
2	26	..	701.75	7	55	6	0	15,350	74,416	7.27	1.50	4.86	20.73	July 4
3	28	4	689.02	8	30	6	40	14,200	70,606	7.71	1 55	5.68	22.40	July 13
4	29	5	638.14	9	15	8	0	13,400	74,500	7.57	1.36	5.56	23.78	July 8
5	21	..	558.0	7	0	6	35	12 000	65.116	7.33	1.36	5.38	26.27	July 5
6	16	15	471.22	8	20	7	5	11,555	63,067	6.48	1.19	5.46	27.75	June 28
7	5	9	206.14	8	15	6	0	8.750	45.916	3.74	.71	5.25	36.38	July 1
A.	27.5	2.25	688.82	8	33	6	56	14,988	71,187	7.31	1 54	4.75	.....	.....

SIMPLE—NORTHBOUND TRIPS.

Reference number.	No. of cars handled. Loads.	Empties.	Weight of train. Tons.	Time on road. H.	M.	Actual running time. H.	M.	Total coal used. Lbs.	Total water used. Lbs.	Tons hauled one mile per lb. coal.	Tons hauled one mile per lb water.	Lbs. water evaporated per lb. coal.	Miles run per ton of coal.	Date of trip.
1	29	..	770.0	8	3	6	50	20,200	85,291	5.92	1.43	4.24	14.76	July 10
2	25	2	645.47	9	35	7	25	22.050	90,125	4.65	1 14	4.09	14.33	July 7
3	22	..	564.71	7	55	6	35	18,900	84,958	4.66	1.44	4.49	16.83	July 5
4	23	..	551 95	8	0	6	30	16,200	75,166	5.41	1.17	4.61	19.87	July 12
5	14	6	399.2	7	30	6	20	13,200	68,333	4 81	.93	5.18	24.00	July 4
6	11	28	370.5	10	5	6	55	13 561	74,541	4.34	.79	5 49	23.15	June 28
7	2	1	32.25	7	5	6	10	9,600	37,166	0.55	.14	3.87	33.12	July 1
A.	24.75	0.5	690.53	8	23	6	50	19 838	83,900	5.05	1.19	4.24	.....	.....

COMPOUND—SOUTHBOUND TRIPS.

1	25	11	727.27	11	0	8	45	13,900	80,583	8.32	1.44	5.79	22.88	July 12
2	25	7	717.10	10	40	9	25	12 750	77,300	8 94	1.47	6.06	23.39	July 7
3	10	34	695.27	12	25	9	40	16,250	93,625	6.80	1.18	5.76	18.20	July 2
4	23	10	678.60	9	15	8	0	12,848	73,125	8.40	1.47	5.69	23.21	June 30
5	31	1	559.86	9	0	6	10	13.850	67,000	6.43	1.33	4.91	22.81	July 15
6	19	15	447 58	10	25	8	25	12,350	70,583	5.75	1.01	5.71	25.75	July 9
7	1	5	27.25	7	0	5	30	4,000	31,585	0.91	.14	6.87	69 13	July 4
A.	20.75	15.5	704.56	10	50	8	58	13 937	81,158	8.03	1.41	5.82	.....	.....

SIMPLE—SOUTHBOUND TRIPS.

1	11	30	729.15	12	2	9	50	23.525	117,875	4.93	.98	5.01	13.51	July 2
2	28	16	705.22	13	0	10	50	18,200	94.166	6.16	1.19	5.17	17.47	July 6
3	12	28	697.26	12	0	9	35	18,800	95,625	5.89	1.16	5.09	16.91	July 11
4	31	4	630.18	11	40	8	25	17,102	91,375	5 89	1.10	5.34	17.43	June 29
5	17	19	527.26	15	20	8	5	17.030	92 208	4.92	.91	5.23	18.68	July 15
6	14	16	393 13	10	50	7	45	12.500	76.664	5.0	.82	6.13	25.44	July 9
7	1	13	135.2	8	0	6	45	8.800	46,833	2.44	.46	5.32	36.13	July 4
A.	20.5	19.5	690.45	12	15	9	30	19,967	99.769	5.57	1.10	5.01	.....	.....

taken for granted that it will be kept up to its full extent, and maintained in good condition, renewals being made as may be found necessary.

2. In the matter of locomotives, the proper number to insure good service, with due regard to the number undergoing repairs, will be determined by the Railroad Department.

3. So far as passenger cars are concerned the department will confer with the various companies so as to insure always having a sufficient number, even at times of exceptionally heavy traffic, without necessitating the temporary pressing into service of baggage or freight cars for passenger accommodation, and without making it necessary to call upon railroads of other countries for the temporary use of their cars.

4. As to freight car equipment the department will await the results of now contemplated additions.

Article V.—The various railroad companies are invited to supplement the existing regulations governing the employment of men, with the view of maintaining the contemplated standard of efficiency. To this end there are to be periodical examinations.

Article VI.—The daily service of women at crossings mut not exceed 12 hours in succession. Substitutes must have the necessary qualifications. The service of children and elderly, physically incapable persons is prohibited. For six weeks before and after child-birth women must not perform service.

Article VII.—Engineers of express and passenger trains must not be employed in baggage or ticket service.

Article VIII.—Railroad companies are requested to supplement these regulations as may be found necessary.

Article IX.—Concerning the putting down of double tracks as proposed on Oct. 2, 1891, the department will confer separately with the several companies interested.

Comparative Tests of Compound and Simple Locomotives, Missouri, Kansas & Texas Railway.

The mechanical department of the Missouri, Kansas & Texas has been making some tests, in freight service, of a Baldwin compound mogul engine and a simple engine of very nearly the same dimensions as shown by the following table:

DIMENSIONS OF ENGINE.

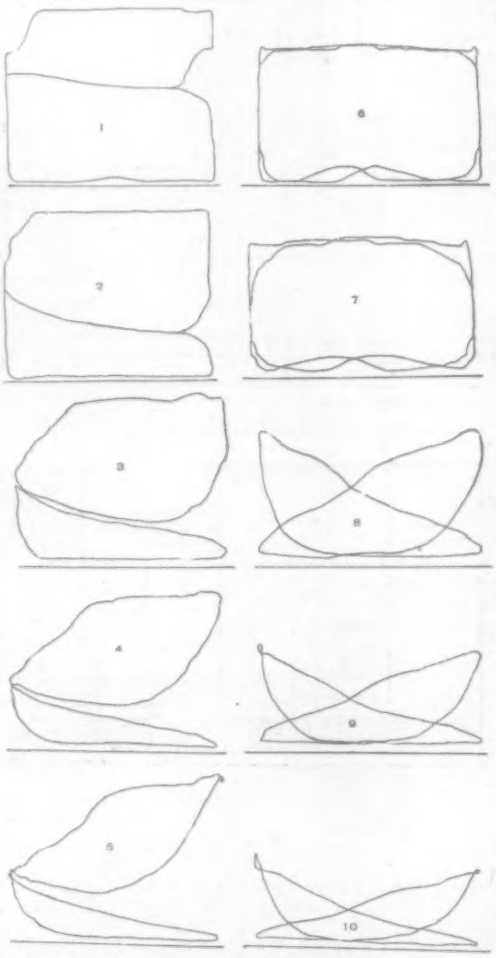
	Compound.	Simple.
Diameter of cylinder..... ..	12½ in. and 21 in.	19 in.
Stroke	24 "	24 "
Weight of engine and tender in working order.....	189,300 lbs.	182,450 lbs.
Weight on drivers.....	97,100 "	91,750 "
Weight on truck.	14,200 "	13,100 "
Diameter of boiler.....	58 in.	58 in.
Diameter of driving wheels.	56 "	56 "
Pressure of steam carried...	185 lbs.	155 lbs.

Engines identical in every other respect except as noted above.

The particulars of the tests are given in the accompanying table which we have arranged in order of the weight of train, placing the heaviest trains first and separating the northbound and southbound trips. We also illustrate some characteristic indicator diagrams from the two engines. These diagrams do not show any specially interesting features except the uneven distribution in the simple engine, which is particularly marked at the higher speeds and results in higher compression than is desirable.

From the total weight of trains hauled and the total weight of coal and water used on all trips, it appears that the total weight hauled by the compound was 9.8 per cent. heavier than that by the simple engine. The coal and water used per ton mile of train are 0·1442 and 0.7639 respectively for the compound, and 0.2023 and 0.9959 for the simple engine. The saving by the compound as shown by the whole test is therefore 28.7 per cent. of coal and 23.3 per cent. of water. The average pounds of water evaporated per pound of coal is 11.25 per cent. in favor of the compound. As the compound is somewhat heavier we should expect it to haul heavier loads, and it appears from the table giving the details of the tests that it did so in several cases.

If we compare the tests on which the heaviest work was done, the saving in coal by the compound is more marked than when figured from the total coal consumed as mentioned above. This is in accordance, we believe, with all other tests of compound locomotives



Indicator Diagrams—Missouri, Kansas & Texas Tests.

and demonstrates the greater advantage of using them in heavy freight service where the engine is necessarily worked very hard at times. We have averaged the results for the first four trips as shown in the table for both engines in both directions, and the results are given in the lines marked *A*. From these it appears that on the four northbound trips the saving by the compound figured on the average tons hauled one mile is 30.9 per cent. in coal and 22.7 per cent in water. On the southbound trips the saving figured in the same way is 31.4 per cent. in coal and 21.5 per cent. in water.

During the month of August the miles run per ton of coal by the compound were 25.2 and were as follows for ten single expansion engines; 15.6, 16, 16.2, 16.5, 17.3, 15.7, 15.2, 13.8, 15.8, 17.6 or an average of 15.97 for the simple engines. This shows an economy for the compound figured on this basis of 36.6 per cent.

The officers of the road state that during five months' service the compound engine has cost nothing for repairs while all simple engines built at the same time have had repairs made, flues rolled repeatedly, bored out, etc. The boilers are washed every two days. "The compound has not had a man in her firebox since she has been on the road and the indications are none will be for sometime to come."

We are indebted for these particulars of locomotive performance on the Missouri, Kansas & Texas Railroad to Mr. Wm. O'Herin, Superintendent Motive Power and Machinery.

Nut Locks.

There are few of the minor parts of railroad fittings that are so attractive to inventors as nut locks. The number used is so great and the cost of manufacture is so small that there is constant inducement to patent new devices. The number of these devices now in use is so great and they are so varied that we have thought it interesting to collect the forms now in current use and show them in our article. We show first the spring type as being the one most in use.

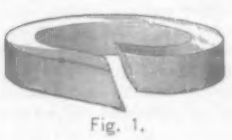


Fig. 1.

Fig. 2.

The Road Masters' convention in 1890 recommended for general main line use an elastic lock washer calculated to stand a compressive strain of 3,000 lbs. with a compression of not more than three eighths of an inch. For frogs and crossings an elastic washer capable of enduring a compressive strain of 6,000 lbs., or a positive nut lock, was recommended. It was recommended further that the washer should give a total bearing service of not less than three-fourths of an inch on each side or preferably 1 sq. in. and that the compression should not exceed 80 per cent. of the total capacity of the washer bofore closing up.

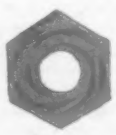


Fig. 3.

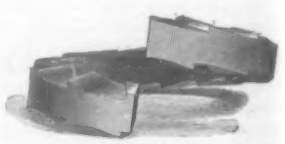


Fig. 4.

The Verona nut lock made by Metcalf, Paul & Co., Pittsburgh, Pa., and shown in Fig. 1 is so well known that it seems superfluous even to mention it. This nut lock was introduced to railroad men in 1875, and it has been so efficient, cheap and simple and handled with such skill that the sales have aggregated 200 millions, and the manufacturers say that the sales in 1892 already reach 13 millions. More than 6,000 tons of steel have been used in making these nut locks. It has been tried by nearly every railroad in the country, and is still standard on a great many. This lock is the typical form of the elastic washer depending for its efficiency on the elasticity of the metal itself. The great success of this washer has naturally developed many modifications of it.

The twisted washer shown in Fig. 2 made by the American Nut Lock Company, of St. Louis is one of the best known of its class after the Verona. This was patented in 1881 and 1883. It will be seen that its principle is precisely that of the Verona, but certain advantages are claimed from the twisted form of the metal. Another advantage claimed is the sharp point which imbeds itself in the angle bar and in the nut. A nut which has

been grooved by this point is shown in Fig. 3. These washers are made of crucible spring steel, and it may be as well to say that the efficiency of any washer of this class depends very largely upon its being made of an excellent quality of steel of high elastic limit. The company informs us that its present output is 500,000 a month, and that 125 railroads are now using this lock.

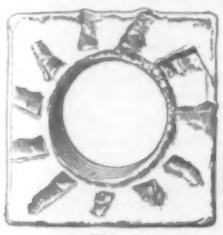


Fig. 5.

Another variation from the Verona is the positive lock washer made by the Positive Lock Washer Co.,

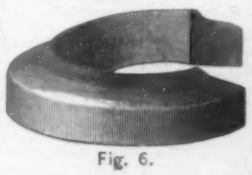


Fig. 6.

Newark, N. J. This is shown and described in a separate article on page 845.

The Harvey Ribbed nut lock made by the American Washer & Manufacturing Co., Newark, N. J., is shown in Fig. 4. This is still another spring washer, but it will be noticed that on both surfaces it is provided with ratchet shaped teeth, the object of which is to cut into the material of the nut and the angle plate. Fig. 5 shows a sketch of a nut drawn in the office of the *Railroad Gazette* from an actual example taken from practice.

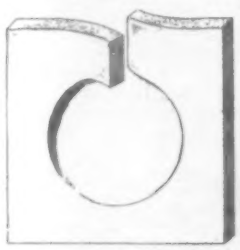


Fig. 7.

Fig. 9.

The indentations in the inner face of the nut made by the teeth of the washer are plainly shown. It is obvious that this action offers a very positive resistance to slacking back of the nut. The output of this washer was 3,000,000 the first year, and it is used on about 50 roads. It is the invention of H. A. Harvey, famous as the inventor of the Harvey process of treating steel.

Fig. 8.

Another variation from the original type of spring washer is shown in fig. 6, which is the National Lock washer, made by a company of that name in Newark, N. J. This nut lock has been found very successful not only for track joints, but in car, bridge and coach work, and in fact in a great variety of applications. It will be

Fig. 14.

seen that it has the familiar features of the Verona, added to which is a thin fin on the outer side of the washer. This thin metal is upset in the thread of the nut and bolt as the nut is screwed home, making a very effective lock. The makers claim to have sold between

A B C

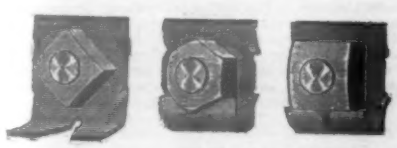


Fig. 12.

70 and 80 millions of these washers for track work alone, although they have been in business only for about three years.

The Eureka nut lock, fig. 7, made by the Eureka Nut Lock Co., Pittsburgh, Pa., is still another split spring washer, but it will be seen that it is materially different in shape from those which have been described before. The large warped surface in this washer makes a very substantial spring; in fact the makers have always claimed that it was the strongest of its class. This also is made from crucible spring steel, and has been sold in very large quantities.

The Excelsior Automatic nut lock made by Messrs. Ruffner & Dunn, Schuylkill Falls, Philadelphia, Pa., has long been one of the most popular. It is shown in figs. 8 and 9. Fig. 8 shows the spring adapted to go over two consecutive bolts. Fig. 9 shows the single lock. This form of nut lock has long been known and used and was adopted as standard by the New England Road Masters' Association in its conventions of 1887 and 1888. The total output of the Excelsior nut lock up to the first of this month was 15,750,000 double locks and 6,850,000 single ones. The daily manufacture is 10,000 double and 3,000 single, and Messrs. Ruffner & Dunn have a list of about 75 railroads to which they have supplied this lock.

The Standard nut lock, made by the Standard Nut Lock Co., of Newark, N. J., is shown in Fig. 10. In this one we have the familiar principle of the spring washer. The makers claim, however, that they have several advantages in this form. For instances, it cannot rotate

Fig. 11.

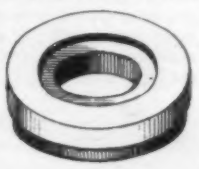


Fig. 15.

with the nut and injure the thread of the bolt; one end cannot get caught in the angle bar slot; it cannot be put on wrong side out as the projecting ends would prevent the turning up of the nut, and its position being fixed it offers frictional resistance to the slacking back of the nut which is lost by other forms of spring washers which, when they have taken a set, turn back freely with the nut. The company has placed trial lots on 140 or more railroads and it is in general use on 19, including some of the largest. It is also in some use in Europe.

The Noble nut lock and washer is made by the A. French Spring Co., of Pittsburgh, Pa. We regret that we are unable to give an engraving of it. It is a spring washer, but quite different from any of those illustrated. It is made of one plate of steel about ¼ of an in. thick 1½ in. wide, and long enough to go over two bolts. The plate is twisted slightly, making a warped surface, so that two corners, diagonally opposite, stand out from the angle plate. Moreover a slit is cut in each bolt hole and turned up to make a sharp barb to engage with the nut and prevent its turning back. The plate is made of spring steel, and it is oil tempered. The tension exerted at each nut is from 2,000 to 3,000 lbs., as shown by actual tests on a Riehlé testing machine, and this tension serves to compensate for the wear and seating of the angle plate and to keep the parts all tight. It is claimed that a torsion spring of this sort gives the greatest strength for given weight of material, and that practical tests for many years have shown the great efficiency of this form of lock which has been, and still is, widely used.

Young's patent reversible nut lock which is shown in Fig. 11 is a recent invention. It is not a spring and therefore cannot deteriorate in use. It has no sharp edges to injure the threads of the nut or the bolt, or as the makers say, "it does not cure evils by destruction," but makes use of a natural law. It will be seen that it em-

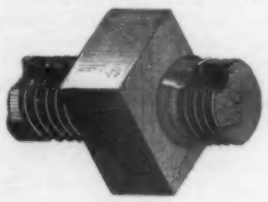


Fig. 13.

Fig. 10.

bodies the principle of the jam nut giving additional bearing to resist the strain; and that it depends upon gravity to hold the jam nut from turning back. Its action is entirely independent of the quality of material or workmanship. The dependent weight acts to hold the lock, and hence the nut to place. It is threaded to suit the bolt, and can do no injury to the thread or to the nut. This nut lock has been tried on several large roads and has given good results. It is controlled and sold by Mr. Ira Abbott, 150 Broadway, New York.

The Jones Safety nut lock is made by the Jones Nut Lock Co., Chicago, Ill. This is shown in Fig. 12. The three examples shown in the upper part of the cut are for track joints; the three shown below are for use on wood, the difference being that for use on wood the body of the washer has barbs cut in it to engage with the wood. *A* and *B* show the design for square nuts and *C* for a hexagon nut; when applied to a track joint the lock is put on with the notched end downward bent as shown. It fits into the angle of the splice bar, which prevents the lock turning. When the nut is screwed home the notched end is bent up to engage the nut. *A* is designed to engage a square nut by the corner and *B* by one of the sides. *C* engages one angle of a hexagon nut. Two years ago this nut lock was said to be in use on over 200 railroads, and some large orders had been received.

The Champion nut lock, Fig. 13, is made by the Peoria Steel & Iron Co., Peoria, Ill. It will be seen that it consists of a groove in the bolt and a ring on the outside of the nut. When the nut is screwed home the metal of the ring is driven into the groove. The bolts cost but a trifle more than the ordinary bolt, and the device has the advantage of decided simplicity. It is claimed that the nuts can be easily removed with a wrench.

The Dill washer nut lock is shown in Fig. 14. It was brought out several years ago, and has had considerable use. It is made by J. F. Dill, Ridgeway, Pa. It consists of two oblong interlocking washers of soft iron. In one end of each washer is a round hole, through which the bolt passes. When the nuts are to be turned the free ends of these washers are bent out of the way by any convenient tool. They are restored to their position by a blow, when they lock the nuts as shown. The same principle has been applied to the locking of three or more nuts. For square nuts, or, in fact, for hexagon nuts, the ends may be left square, instead of notched as shown here.

The vulcanized fibre nut lock shown in Fig. 15 had considerable use some years ago, but we believe that it has nearly passed out of use now. It is mentioned here merely as illustrating a type. Its efficiency depended upon the introduction of an elastic substance. The simplest form of the type of course is a block of hard wood between the nut and the angle plate, but the rapid destruction of the wood, added to its unsightly appearance, makes its use impracticable. The vulcanized fibre lock was expected to be more durable and more mechanical in appearance. This consists of two iron washers with a fibre washer interposed between them. We believe that experience has shown that the fibre deteriorates by decay, hardens by exposure, and is crushed under the severe pressure of use.

No account of nut locks would be complete without mentioning the Harvey thread, but mere mention is sufficient, as the principle is thoroughly well known to everyone.

The Goldie Tie Plate.

The evolution of the tie plate goes on, and the one now illustrated is the latest result that we have seen. It is the design of Mr. William Goldie, the inventor of the well known Goldie spike, and is made by Messrs. Dilworth, Porter & Co., Ltd., of Pittsburgh. This company announces that it has commenced the manufacture of the Goldie tie plate on a large scale, and that it rolls the plate in its own mills, of the best soft steel and under careful supervision, to insure uniformity both of material and manufacture.

The Goldie Tie Plate.

The plate is so well shown in the cut that description seems superfluous. It is made ½ in. thick, 8½ in. long and from 4 to 6 in. wide, as ordered. It is rolled so as to be slightly concave on the upper side at the middle of the base of the rail, and convex to the same extent on the lower side, and the makers claim that exhaustive experiment has shown that it has less tendency to buckle than any other plate now on the market.

It will be observed that the plate has a shoulder to take the outward thrust of the rail; also, that it has two flanges or ribs with sharp edges which enter the tie at right angles to the grain of the wood. A powerful resistance to movement of the plate is thus secured, while it is claimed that the indentations in the tie being entirely covered by the plate will not collect moisture and thus start decay.

The Thacher Compressed Air Dump Car.

On Tuesday of last week an exhibition was given near Garfield, on the New York, Lake Erie & Western, of the Thacher dump car operated by compressed air. There were but two cars, which were loaded with gravel and attached to an engine fitted with the necessary pipes, operating valve and connections. It is said that these cars were actually dumped in two seconds, although some of those who held their watches said that it was done so quickly that they could not time it accurately. The Canadian Pacific has 50 cars, essentially the same as those exhibited on the Erie, now in service. They are used in two trains of 25 each. These cars were tried in Montreal last September and then sent west loaded with coal, for service at Vancouver, where they will be used in filling a big trestle. Narrow gauge cars of the same kind have been used in Colorado for some time. These, we believe, are all the cars that have been built, but they are sufficient to prove the practicability of the idea and to carry it through the experimental stage.

The mechanism is really very simple. By reference to the illustrations it will be seen that the operation of dumping is performed by a piston working in a cylinder to which compressed air is admitted. If intended

to dump on one side only, the car is level when the piston is at the bottom of this cylinder. If it is intended to dump on both sides, the car is level when the piston is at mid-stroke. The air is taken from the main reservoir of the locomotive and from an additional reservoir, if that is preferred, by two train pipes, and is admitted to one end or the other of the cylinder according to the action desired. A three-way cock on the engine controls the flow of air.

One of the most important details of this device is the automatic latching and releasing by which the cars are held level when running or released when the time comes to dump them. The details of the latching and release mechanism are shown in fig. 1. It will be seen that there is a special small cylinder governing the latching and unlatching, and that the position of the piston in this cylinder controls the latches. In early designs this latching apparatus was worked by a third train pipe, but in later designs this pipe has been eliminated, and the air flows through the latching cylinder before it is admitted to the dumping cylinder. The apparatus has been still further simplified in the latest designs, casting the latching cylinder and the dumping cylinder in one, which, it will occur to the mechanic, can very easily be done to great advantage in way of simplicity. By compelling the air to go through the latching cylinder before admission to the dumping cylinder, there is no possibility of failure to unlatch the cars before dumping, which of course is a very important matter. The great power of the air cylinder would be sure to break something if it were attempted to dump the cars while they were still latched.

It will be seen that this device is a very ingenious one for saving time and labor on trains handling material that is to be dumped. It can be used without much complication on cars dumping both sides of the track, and it can also be applied to a 60,000 lb. coal car dumping in the middle of the track. Designs for this application have already been made. The advantages of such an apparatus that will dump a whole train instantly are obvious. It will not only save the time of engines, trains, train hands and working gangs, but what is often of great importance, it will allow a train to dump and get out of the way of approaching trains very quickly, as these cars can be dumped while running. So far as we can learn this apparatus appears to have had sufficient success in actual practice to warrant a very careful investigation and trial of it.

Fig. 2 shows a cross sectional elevation of a car with air brakes. Fig 3 shows a plan of a car without brakes, it gives an idea of an early disposition of the parts; the third pipe for actuating the latching and releasing cylinder is not used now. Fig 4 shows one of the Canadian Pacific cars.

The car is made by the Thacher Car & Construction Co., Bennett Building, New York City.

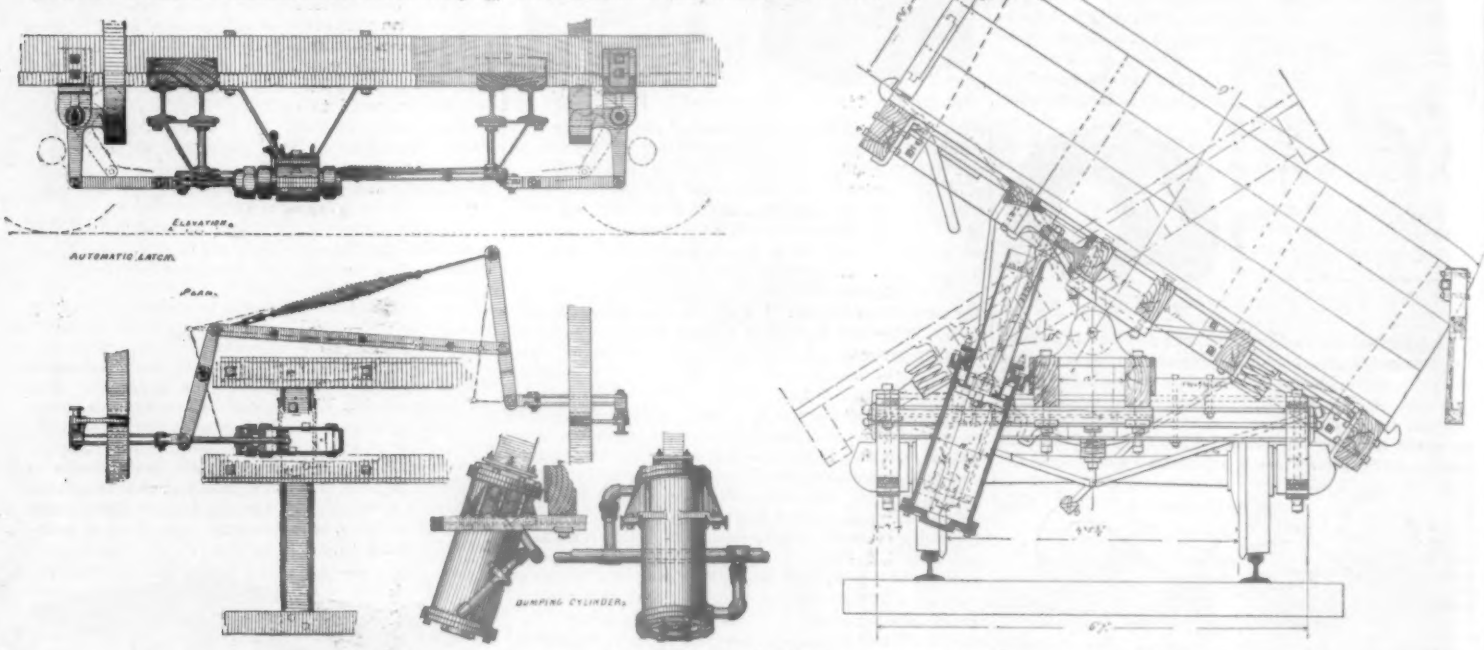


Fig. 1. THE THACHER COMPRESSED AIR DUMP CAR. Fig. 2.

The Holland Dikes.*

Mr. Starling has chosen a modest title for his masterly monograph on the dikes of Holland, and he has condensed into a hundred pages a compendium of the history, functions, structure, cost and value of these world-renowned, but hitherto not well known, creations of the Dutch engineers, that is as valuable as it is exhaustive and complete. The author brought to his work a special fitness and comprehension derived during his long connection as District Chief Engineer with the Mississippi levees, and his devotion to the object was so great that he twice visited Holland, in 1889 and 1891, and in the interval made himself acquainted with the language of the country and its literature on the subject. Thus well equipped he was enabled to meet the hospitable Dutch engineers on their own ground and to obtain from sources that are sealed to most the copious information that he has so freely contributed to his professional brethren and to the public in this memoir, which is a monument alike to his zeal and intelligence. From a work at once so concentrated and comprehensive it is difficult for the reviewer to select special features which will serve to give an adequate idea of its scope and merits, but the excerpts which space permits will indicate its general character.

Naturally there was a technical leaning more toward the dikes than to other "engineering marvels," as the author terms them, and more to the river dikes than to the sea-protection, but the latter had their fair share of attention. Information, the author tells us, was sought especially on the following points: Sinking and permeable foundations; bad material; prevention of leakage under the dike; dimensions compatible with safety; use of culverts through dikes; protection against storms; causes of breaks; specification of work; experience with outlets; methods of administration. In his search for this information he found the Dutch engineers both intelligent and courteous, which should not surprise anyone who has known the Hollanders in their homes; but is none the less gratifying when we remember that they are so far ahead of the rest of the world in this branch of engineering. He acknowledges especially his particular obligations to Mr. W. F. Leemans, The Hague, Chief Engineer in charge of the Great Rivers; C. F. M. H. Schnebelie, Bois-le-Duc, Chief Engineer in charge of the New Maas Mouth; Mr. Wisboom, his assistant; Mr. P. H. Kemper, Utrecht, Engineer of the Merwede Canal; Mr. Koole, Resident Engineer of the Westkapelle Dike; Mr. H. E. Bruyn, of the Waterstaat office, at The Hague, and Mr. J. J. L. Bourdrez, of Middleburg, Zeeland, student of engineering at the Polytechnic College at Delft. All these gentlemen took particular pains to supply him with information, at the cost of some trouble to themselves.

Before proceeding in detail the author states that he visited some of the most remarkable seaworks, which filled him with admiration, but also with despair, as there seemed hardly a possibility of ever being able to imitate them. What interested him particularly were the river dikes, from their close analogy to those of our own country, and it was those, accordingly, that received most of his attention. The Dutch have had the same problems to solve as we, and a study of their methods, adopted after a long experience, ought to be of some profit to us.

The extracts which follow are taken from the text without change, excepting that paragraphs and sentences not necessary to a general review are omitted.

Dikes, in one form or another, have existed in Holland from a very early time, but the beginnings of the present system are said to date back to about the thirteenth and fourteenth centuries. In the fifteenth century (1421) a terrible storm carried away the sea-dikes for a great distance, destroyed seventy-two towns and villages, inundated 200,000 acres of land, and is said to have cost the lives of 100,000 people. It gave an entirely new conformation to the Lower Rhine and Maas, converting an inhabited district into a great swamp, which has only lately been partially reclaimed. The "Saint Elizabeth's Flood," as it is called from the day of its occurrence (the 18th of November), is thus an important date in the hydrographic history of Holland.

The country which we call Holland is denominated by its inhabitants the Netherlands or the Low Countries—the name Holland being restricted properly to the two provinces of North and South Holland. While, on the whole, a flat region, it is not uniformly so. It consists of two separate divisions, of different geological periods, and, of course, diverse in their types. One is strictly alluvial, that is, it was formed while man was on the earth; the other is pre-alluvial, though still belonging to the Quaternary epoch. Briefly, the two divisions may be called uplands and lowlands. The uplands comprise about 41 per cent. of the whole surface of the Netherlands.

In taking measures for defense against the external waters, it is clear that the most dangerous and pressing enemy is the sea. A great part of the Netherlands is directly exposed to its attacks. North Holland is simply a narrow peninsula, with the sea on both sides. Friesland, Groningen, Gelderland and Utrecht border on the Zuider Zee. South Holland and Zeeland abut directly on the North Sea. Much of the country is below low tide, nearly all below mean flood. Storms would cause the waves to sweep over the whole land, and the damage that they would do is best shown by the frightful ravages which they have committed in the past. The first and all-essential provision is then to be made against the sea.

Holland is intersected by five large rivers—three branches of the Rhine, the Maas and the Scheide. Of these, the last is hardly a Dutch river at all, as it barely enters the territory of the Netherlands with its estuaries. The others have almost all their alluvial part in that kingdom. It is impracticable to shut off these rivers from the sea. They are too large. It would be practicable to dam them, but so great is the volume of water which they discharge that it would be well-nigh impossible to keep them drained. Sluices could hardly be built large to carry off their waters into the ocean at low tide, and even if this were possible, they would have to be drained by pumping at high tide. Now, the greatest draining machines in Holland have a capacity of about 100,000 cubic metres per hour. The high-water discharge of the smallest of the great rivers, the Maas, is more than eighty times that much. The mouths of the rivers must be left open. But if the mouths are left open, the floods of the ocean will rise in them and overwhelm the lowlands just the same as if they were directly on the seacoast. Not only so, but the rivers themselves are subject to formidable freshets, rising nearly as high as the floods of the sea. On all these accounts the rivers must be diked, or they will overflow the land. The fluvial part of the Netherlands is divided into a number of islands, each of which has to be completely enclosed by a ring dike. Of these islands some are large and some are small. The portion of North Holland lying north of the Y—now the North Sea Canal—is an island; so is the still greater territory composed of portions of North Holland, South Holland, Utrecht and Gelderland, bounded on the north by the Y and the Zuider Zee, on the east by the Yssel, on the south by the Lek and its continuations, and on the west by the German Ocean. A very important island is included between the Lek and the Waal, from their point of separation, and bounded on the west by the Noord, and comprehending the districts called the Over Betuwe, the Neder Betuwe, the Land van Buren, the Land van Culemborg, the Tielerwaard, the Vijfheerenlanden and the Alblasserwaard. Being completely inclosed by dikes, these tracts can have no natural drainage. They must either discharge their rain water through sluices into the rivers or the sea, if the latter be low, or be pumped out if the external water be higher than the internal. In point of fact, both these systems have to be resorted to. As the several portions of each inclosed island are of different elevations, some being 1 ft. below mean flood, and some 15 or 20, the lowest tracts are usually themselves diked in. Moreover, as precautions against possible breaches in the river or sea dikes, there are occasional interior lines of embankment, dividing some of the islands into subordinate districts, and serving, like the water-tight compartments of a ship, to limit the extent of the injury.

Dikes may therefore with propriety be classified as sea dikes, river dikes and internal dikes.

The sea dikes are distinguished by their great strength. As they have to stand the shock of very heavy waves, they must be built with a very long slope—as this has been found to be one of the most effectual safeguards against damage by breakers. A "seabeach slope" of 40 or 50 to 1 is of itself usually a sufficient protection against further cutting. Of course, it is not practicable to give so flat a slope as this at all places, or perhaps at any. The front of the dike must then be protected by artificial means, usually by stone, giving, however, to

* *Some Notes on the Holland Dikes.* By William Starling, M. Am. Soc. C.E.; with Discussion. *Transactions* of American Society of Civil Engineers. (Vol. XXVI., June, 1892.)

the dike as flat a slope as possible, consistenly with economy—else the stone revetment would have to be too heavy, and would be too precarious. The result of endeavoring to reconcile these two independent principles has been the evolution of a cross-section for the sea dikes which combines some features of each.

Not all of the sea coast needs artificial protection against inundation. The western shores are naturally defended, in a great measure, by a chain of dunes or sandhills extending, with little interruption, from the Helder, the northern extremity of the peninsula of North Holland, to the mouth of the Maas, near Rotterdam. Dunes also exist on the western coasts of the islands of South Holland and Zeeland. They are heaped up by the action of the winds, like snowdrifts, and are subject to gradual and continual migration inland from the same cause which created them. Similar phenomena are common on other sea coasts, notably on the eastern shore of our own continent, where the landward movement, apparently almost irresistible, has done serious damage and threatens more. In Holland the natural mobility of the sand has been counteracted, to a great extent, by planting the seaward slopes of the dunes with a species of reed grass (*Arundo arenacea*), locally called helm. This takes root even in pure sand, and holds the material in place. It is planted in tufts about 2 ft. apart. The few points on the western coast where the dunes are missing, the western shores, and most of the eastern, of the Zuider Zee (the exceptions being where the uplands abut directly upon the water) are protected by dikes.

It may be mentioned, in this connection, that the term dike is generally applied by the Dutch only to works of primary importance, intended to keep out sea or river water, or which have at some time served such a purpose. Embankments of inferior grade usually go by the name of kaden or quays.

The river dikes are much less massive than the sea dikes, and are of very variable dimensions, according to the material of which they are built, the foundation on which they rest, the extent and value of the country which they protect, the resources of the local organizations which maintain them and many other considerations. They also, like the sea dikes, are exposed to wave action. The rivers are wide and have long bends, through which the winds have full sweep. The destructive force of the wind is found to be specially great when it blows up stream. It is necessary then to make provision against this danger. River dikes are exposed to other perils, some general to all dikes, some peculiar to rivers, some incident to particular rivers, which cause them to be built in forms very different from those which might have been expected.

The sea dikes are constructed of such superfluous strength that they are not generally instructive as a study. The river dikes have not been built with the same lavish expenditure. They bear the marks of having been evolved by a gradual process from small beginnings, and it is evident that economy has been studied in their construction and maintenance. For these reasons and also because they were closely analogous to those which the author had to look after at home, he gave them much more attention, and inspected considerable stretches of them personally.

It is perfectly possible to construct a good and tight dam or dike out of poor material, by devices familiar to engineers, such as building in thin layers, rolling, watering, ramming or tamping, puddling and the like. But if the natural soil be porous to a high degree, there will be leakage under the embankment to an extent which may be very inconvenient and even extremely dangerous. The water which thus transpires through the soil is called by the Dutch "leak-water," and by the Americans of the Mississippi Valley "sipe-water" (pronounced *seep*). It is sometimes enormous in quantity. If the soil be of a fibrous and tenacious kind, so that a certain continuity and coherency are preserved in a moist or wet state, the evil will probably be confined to mere leakage, which will be embarassing or damaging in proportion to its quantity, its duration and the means of getting rid of it by drainage. But if the soil be composed of loose and independent particles of small size, it may become exceedingly unstable and even mobile when saturated with water. A fibrous or honeycombed soil, though never so porous, yet presents, as it were, a network of capillary tubes, which affords a strong frictional resistance to the flow of water and diminishes the hydraulic head by so much. But earths of the second kind permit their particles to be perfectly enveloped by the liquid and held in suspension by it, in proportion to their smallness and lightness, perhaps also to the cohesive union between the water and the particles, which is different in different earths. Hence results a variety of treacherous and semi-fluid soils, commonly classified together as "quicksands," which instead of remaining in place and resisting the passage of water, are actually carried by it and are, as it were, incorporated with it. It follows that such soils will transmit the pressure of the external water with comparatively small loss. It is evident that if the water stand very high against the embankment, the pressure transmitted under the bank will be exerted upon the layer of strong soil, if such there be, overlaying the quicksand, and if this be thin, will "blow it up," as it is called, thus knocking the foundation from under the dike or levee, and causing the destruction of the latter. This is no chimerical or merely speculative danger, but a very real and threatening one. The five breaks which took place in the Mississippi Levee District in 1890 are believed all to have been due to this cause, and in "water-turning" constructions of all kinds in Holland extraordinary precautions are taken against it.

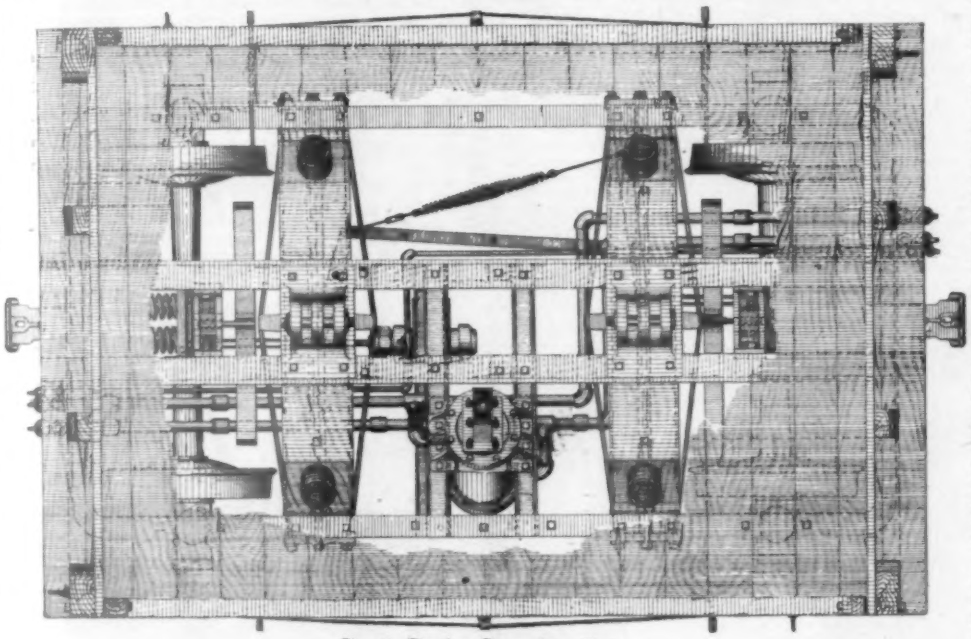


Fig. 3—Thacher Dump Car—Plan.

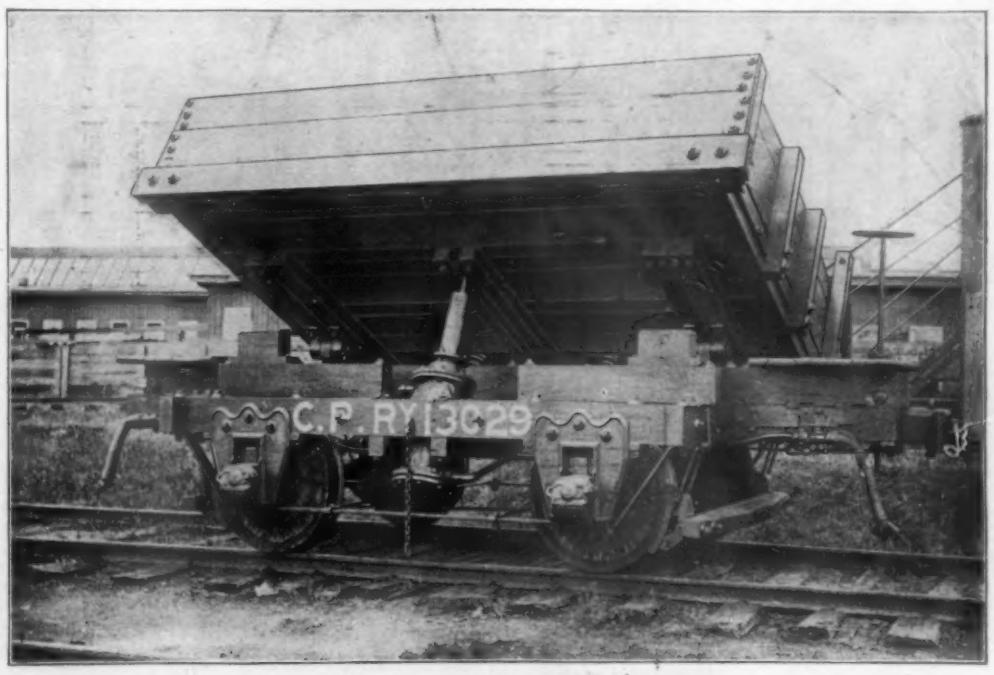


Fig. 4—Thacher Dump Car.

As to the construction of dikes themselves, there are pretty minute directions in the "General Regulations" (Algemeene Voorschriften) which are published for the guidance of contractors of all kinds of work. There are two sets of these, one published by the Waterstaat and the other by the corps of military engineers. Each is a volume of 250 pages or so, and contains standing regulations for the performance of work of every sort. Each is made a part of all contracts entered into with the respective organizations by whom they are issued. There are also many very practical and useful precepts contained in the "Manual" of Storm-Buysing.* From these sources, principally, some remarks have been compiled on the construction, maintenance and defense of dikes, which it is hoped will be found instructive. Where they are not consistent with the present practice, so far as this could be ascertained, they have been corrected.

The tracé of the new dike should, of course, have regard to economy of material and capacity for protection. Its general direction should run nearly parallel to that of the stream, but should avoid, as much as possible, exposure to the most destructive and prevailing wind. But especially the fitness of the foundation should be regarded, and good, high ground selected, free from creeks or sloughs. Sharp angles are to be condemned—especially re-entering angles, because they make basins in which the wind has full play to raise the waters Where changes of direction occur, they should be made. by a curve, uniting the two tangents.

The material of the dike should, if possible, be clay and should be taken from the outside. If clay cannot be had in that situation, then resort must be had to the inside. Sand has little cohesion and does not make a strong and water-tight dike. Peat has too little specific gravity, often less than water, and will not answer well. Mold or arable ground, though not so good as clay, is far better than sand or peat, packs closely, and is especially suitable for dressing slopes that are to be sodded, as grass grows finely in such soil. Clay cannot usually be had in sufficient quantity to build the whole dike. It must, therefore, be combined with other material. This may be safely done, provided the precaution be taken to put the best and purest clay in and next to the front slope, while the poorer earth is placed in the body of the dike. There are examples of dikes that consist of very sandy material, with a dressing of only one metre of clay, yet they turn water excellently.

Trees on dikes are highly prejudicial. They prevent the dikes from becoming thoroughly dry. Grass does not grow well in their shade or under their influence. They are shaken even to their roots by heavy winds and the ground loosened accordingly. (Add to this that there are frequent cavities under the arch of the roots of large and especially old trees, and that considerable streams of water may be conducted through the dike by means of the lateral roots. The latter are subject to decay and then constitute formidable channels. This salutary precept is often violated. Many important dikes have double rows of trees for long distances, for the purpose, apparently, of giving shade to travelers. Impunity has brought about recklessness which may possibly result in disaster in time of some great flood.) The planting of trees outside a dike at a safe distance is to be encouraged by all means as a protection against waves and ice. (A thick growth of small timber outside a dike is undoubtedly an effectual safeguard against even heavy storms. A thin and scattered growth, even though of considerable width, is not of much value.)

After a detailed account of the methods of building the dikes, the author proceeds to an elaborate consideration of bank protection, including *hoofden* (hoofden, literally heads, are of very general use in Dutch engineering; the term *hoofd* is applied to any spur dike, but especially to the elaborate constructions which are designed to resist the action of the winds and the currents of the sea), *zinkstukken* (mattresses), pile work and stone, or brick, pitching.

In connection with the stone, *perkoenpalen*, or small piles, are used in revetments to keep the stones from slipping downward. Various kinds of surface dressing are next described in detail, copiously illustrated by plans. Brush is used in vast quantities, and it is well for us to pause a moment over the author's comment, that as there are no primitive forests left in Holland, the rough-and-ready methods of construction which prevail in America, where the wild and natural growths are common and cheap, cannot find place in the older country. Instead of trees, poles and large brush, which would be of long growth and dear, the Dutch use combinations of small brush, which can readily be raised artificially and in a short time.

Tarpaulins used for temporary protection on injured slopes and various other expedients are described.

Passing to internal injuries to dikes, the author devotes considerable space to the several causes; undermining, leakage through or under the dike, weakness of foundation and actual overflow, with application to

* D. J. Storm-Buysing, Handleiding tot de Kennis die Waterbouwkunde, voor de Kadetten van den Waterstaat en der Genie. Breda, 1841-45. Two volumes, with atlas. A later edition was published in 1868. This work has not been superseded, though it appeared so long ago, and is still the recognised authority. There is a vast encyclopedic work in course of publication which will, however, eclipse everything else—the "Waterbouwkunde" of Professor Henket and others. Eight volumes of text and eight of plates have already appeared, and there are ten more of each to follow. The price will be about $200. The Dutch Waterstaat corresponds to the French "Ponts et Chaussées," and the term Waterbouwkunde embraces not only canals, dikes, etc., but roads, bridges, railways and land drainage. Henket's collection has not yet got so far as dikes—or had not last August.

similar manifestations in our own country and especially upon the Mississippi.

Having discussed the principles of dike construction, Mr. Starling calls attention to some of the types that present themselves in existing structures; this part of the work is very valuable and rich in information and illustration.

He next passes to the consideration of *polders*. A polder is a piece of land encircled by levees for protection against water from without and control of the water within. The Haarlem Meer is a polder; it was once a lake of 70 square miles in area. (The Zuyder Zee, now being reclaimed, will eventually be a polder containing 1,000,000 acres.—ED.) Draining the polders is by means of sluices, locks or pumps. Pumping is done now chiefly by steam power, but wind, formerly the sole dependence, is still utilized. Full descriptions and illustrations of the pumping engines are given.

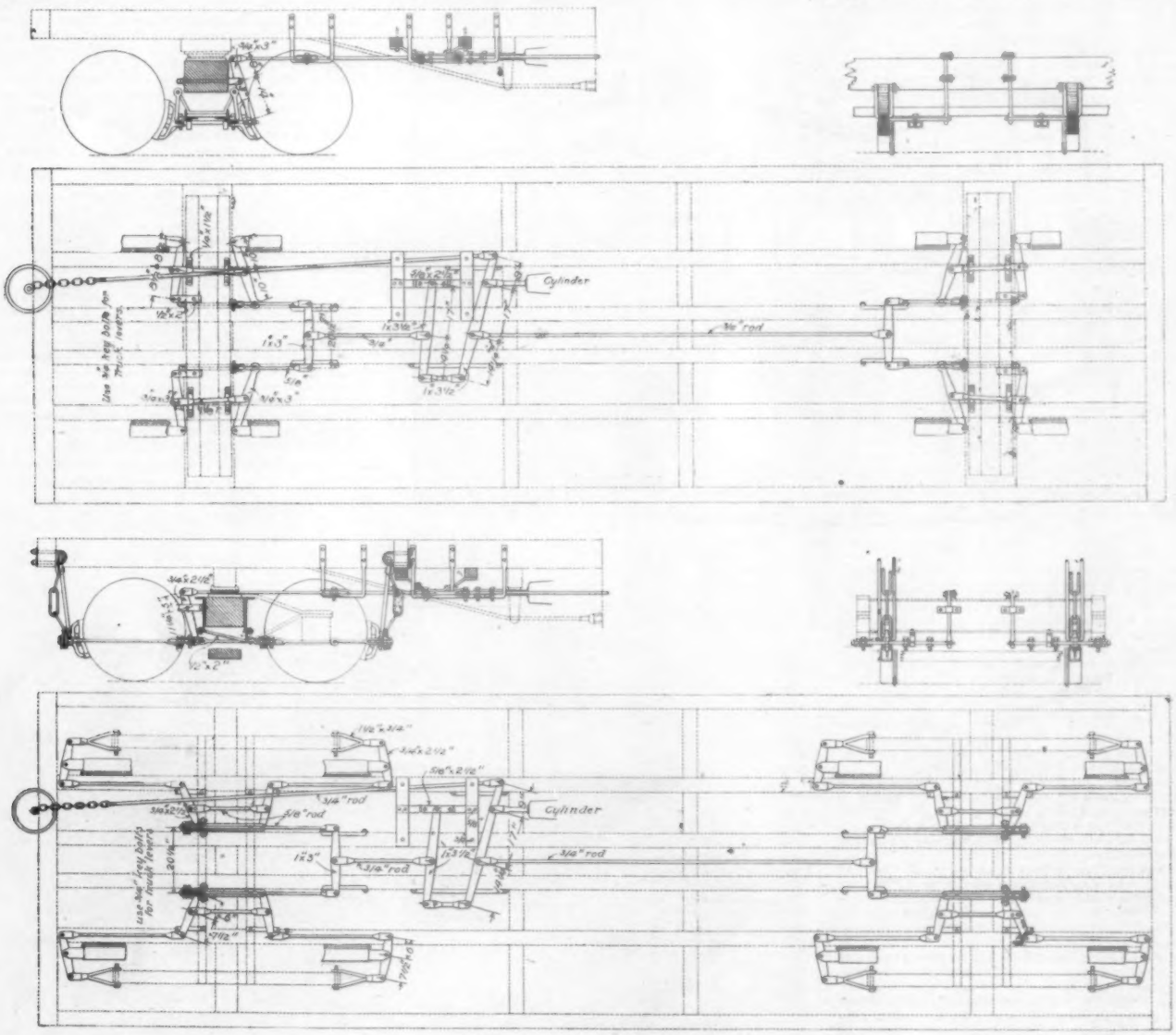
landed proprietors, or, as we should say, by the property, in proportion to ownership.

According to Baedeker the annual expenditure of the whole kingdom for dikes is about $2,300,000, exclusive of new works.

A word should be said about the remarkable system of military inundations, by which it is proposed to lay certain portions of the country under water, in case of necessity, to obstruct the progress of an enemy. To give any intelligent exposition of this plan would require much careful study. Suffice it to say that it is not designed, as might be supposed, to drown the enemy, but merely to make the roads impassable and the country untenable, and that it is necessarily applicable only to the low lying polder land, that is, North and South Holland and Utrecht. The inundations are to be produced by sluices specially contrived for the purpose, either so-called fan sluices, or sluices closed by stop plank, or simply by cutting away certain overlaten. These works are placed under the guns of powerful forts. Of course, the inundations are to be accompanied by vigorous military and naval operations.

Braun's Brake Arrangement.

The accompanying cut shows a brake arrangement that is being tried on the Houston & Texas Central by Mr. James McGee, Master Car Builder. Two cars have been built with this apparatus, and it is reported that it is working satisfactorily. Of course, there are a good many joints to this gear, and there must be considerable free slack after it has been used awhile, but there are no brake beams and the deflection of the brake beam is, therefore, avoided, but in its place is the combined deflection of a considerable number of levers. Until such gear as this has been tried pretty thoroughly, one could hardly believe one of the claims of the owners, which is that it makes a stiffer arrangement, with less slack. It is also claimed that there is no danger of its being torn off by obstructions on the track and in danger of dropping and derailing a train.



BRAUN'S BRAKE ARRANGEMENT.

Some of the great projects now on foot are outlined, notably providing a new mouth for the Maas River and the closing of the present outlet, the enormous dams required being described in detail and the difficulties of building them in the beds of active streams and the means adopted are fully noted. The statistics of cost are too detailed to be generalized and they, of course, are applicable to the different conditions met with in Holland, but instructive comparisons can be made from them. The construction of new dikes is generally or always undertaken by the Waterstaat of the kingdom, at least on the mainland. In Zeeland, which maintains an isolated existence, the several polders bear all their own expenses in this way if they are able; if not, they seek assistance from the state. After the dikes are once built, however, their maintenance and enlargement are committed to the local authorities. The head of the department is the Minister of the Waterstaat, Commerce and Industry. He has an advisory engineer staff. There is a chief engineer for the great rivers and one each for very great works; besides these, there is a chief engineer for each province. There are local organizations for maintaining the polders; sometimes each polder is independent, but more commonly several or many polders are united under one *waterschap*. There is another kind of body charged exclusively with the supervision of completed dikes, sometimes appointed by the Crown and sometimes elected by the freeholders. The expenses of management, maintenance and repairs are usually borne by the

The sea-coast of Holland is said to be 1,500 miles in extent. Probably about 800 of it is protected by dikes. The author has seen somewhere an estimate of the length of the river dikes, placing it at more than 800 kilometres—or, say, 500 miles. The dikes are only a part of what Holland has found it necessary to do to build up a country. Of enterprises recently completed or still in progress the North Sea Canal, which gives Amsterdam its access to the ocean, cost $14,000,000; the New Waterway from Rotterdam to the sea, through the Hoek van Holland, cost $13,000,000; the Merwede Canal, from Amsterdam to the Waal, will cost $10,000,000; the new Maas Mouth will cost $6,000,000. The state which has accomplished all this has a superficies of 12,738 square miles, and a population of about 4,600,000. It is impossible to visit Holland without an increasing admiration of the plucky, free, intelligent people who, by sheer force of industry and genius, have created for themselves a country almost against the will of nature. Surely the Dutch indulge in no empty boast when they say, "God made the sea and man made the land!"

Not only the engineer, but the statesman and the citizen, will find much to interest and instruct in this publication. The world probably presents nowhere else a more striking example of work done by the State *pro bono publico* and of the separation of the cost of private benefits from the expenses of the Commonwealth; how this is done and how well it is done Mr. Starling's Notes attest; the question will occur to many, how long before we in America reach the same point in our civilization?

Wreck of a Trestle.

Near Hazleton, Pa., on Nov. 7, ten loaded coal cars being run out from a mine, broke through a trestle 40 ft. high, killing one and injuring six of the workmen. Two or three of the injured are quite likely to die.

The construction is as follows: Each brake shoe carries a lever at its centre. One end of the lever is attached to a fulcrum secured to the truck frame on the outside, and the other end is attached to a rod leading to the centre of the truck where there are two vertical levers connected at their lower ends to a rod leading to another equalizer or lever which is attached at its centre to a rod leading to still another lever which is attached to the hand brake chain and to the brake cylinder piston rod. The construction of this device is very clearly shown in the accompanying cuts for both inside and outside brakes.

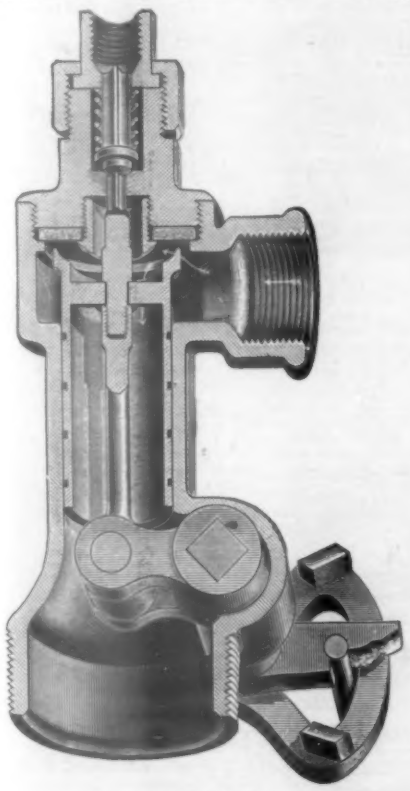
The Curtis Return Trap.

The Curtis Regulator Co., of Boston, has put on the market a return trap of new and improved design. The company calls attention to the difference between a return trap and a discharge trap, namely, that the latter takes the water of condensation from the coils or other condensing surface and simply discharges it into a drain or open tank, to be wasted entirely, or cooled down sufficiently to be returned to the boiler by a pump or injector; while the return trap takes the water from the condensing surface, whether that surface be above or below the boiler level, and automatically returns it into the boiler at the temperature due to the pressure at which the steam is condensed, thus saving a large percentage of the latent heat taken up by the water in forming steam. The receiver being below the lowest coil or drip-pipe, the water of condensation falls into it

by gravity, and there need be only enough pressure in the receiver to force the water up into the trap, which must be placed above the water line of the boiler, requiring one pound pressure for each two feet of elevation above the receiver, and a pound or two more to insure rapidity of movement. The water rising in the trap raises a float, which, at the proper moment operates the valve, letting full boiler pressure on to the surface of the water in the trap. A check-valve on the inlet pipe prevents its return to the receiver, and gravity causes it to find its level with the water in the boiler, with which it is connected by the outlet pipe through the boiler check-valve. The series of movements is simple and natural. Steam being let into the coils is condensed and falls by gravity into the receiver; it is forced thence into the trap; the water in the trap becomes connected top and bottom with the steam and water in the boiler, and falls by gravity into it, the steam taking the place of the water, and being in turn condensed by the incoming water at the next stroke.

One essential advantage of this return trap is, that as there is no other outlet from the condensing surface, there can be no waste of steam or water. It must all go back into the boiler; and further, as this return is pure distilled water, at a very high temperature, it is in the most perfect condition to benefit the boiler. This feature is of great advantage where the water is impregnated with lime or sediment. This pure water makes no scale, but has a tendency to remove scale already formed.

Again, it delivers the water into the boiler against any pressure that may be in the boiler, regardless of the fluctuations of the boiler pressure, returning all the condensation with equal certainty and rapidity at either high or low boiler pressure. Where there is a street pressure on the water supply,



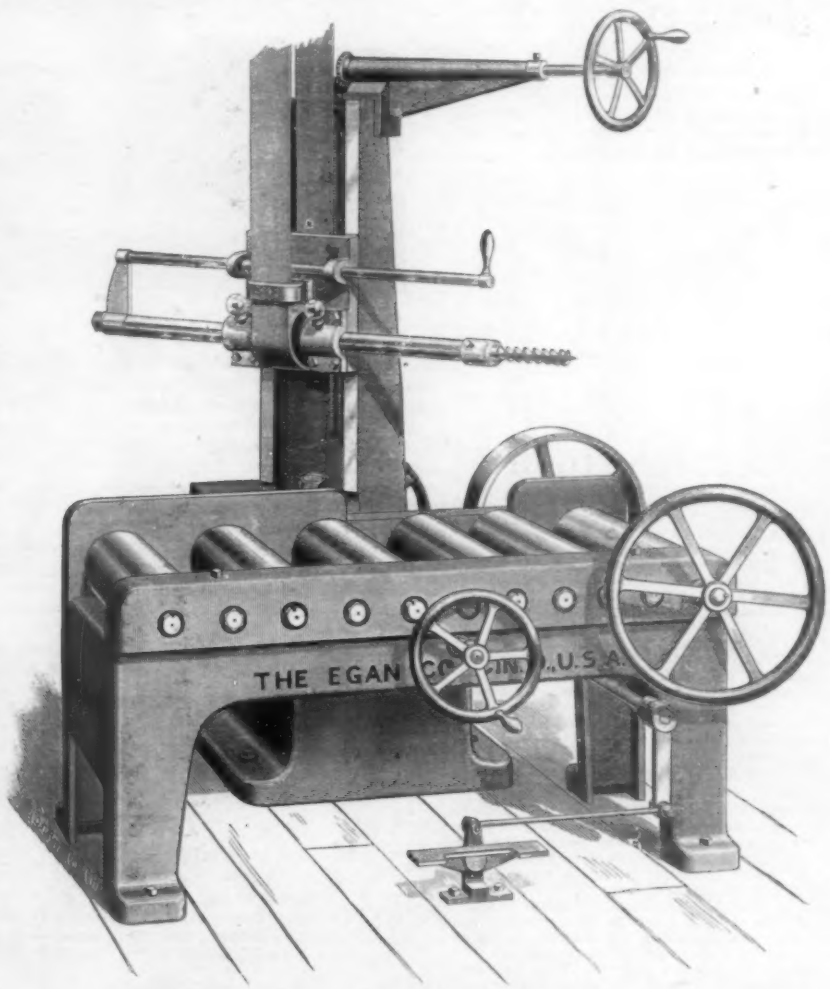
Curtis Return Trap.

this return trap can be used to supply all the water needed in the boiler, thus doing the same work as pumps and injectors, and putting the water into a boiler at a far higher temperature than is usually possible. When a heater is used, the water can be fed into a trap through it. This trap will not return the water from heating pipes where low pressure, produced by a pressure regulator or exhaust steam, or both, is used; the only requirement being that there shall be enough pressure to lift the return water into the trap.

The particular improvement to which attention is called is the steam valve as shown in the cut. It will be seen that this valve is single seated, and yet balanced, that the seat is a removable Jenkins seat, and therefore perfectly tight, which is the essential in a return steam trap. The valve and seat are removable for examination without removing any gasket or bolt, and the air relief valve is automatic, being only open when the steam valve is closed.

Improved Horizontal Radial Car Borer.

This machine is the latest of the Egan Co. in the line of boring machines. It will bore all kinds of straight or angle holes for car and bridge work with rapidity and ease. The column is single, with the main roller frame resting on and bolted to it. The vertical part of the column revolves, and its centre is the centre of the mandrel. It is also made to move in and out on the main column, and carries the spindle and slide moving up and down operating by handwheel and screw. The rolls are 6 in. in diameter, all driven by gearing and friction operated by foot power. These rolls can also be driven by hand at the will of the operator. The mandrel is of steel, of large diameter, and has a vertical stroke of 26 in. and a horizontal stroke of 24 in. The countershaft is placed above and provided with a new device, to allow the spindle to be driven at any position without any changes being made. The tight and loose pulleys are 10 in. by 5½ in. face, and should make 1,000 revolutions per minute.



Improved Horizontal Radial Car Borer.

Some Experiments on the Effect of Punching Steel Plate.*

The experiments of which this paper gives a summary, were made in the mechanical laboratory of the Case School of Applied Science under my direction, by Mr. F. H. Chamberlain of the class of 1892, and formed a part of the work for his graduating thesis. The punches and dies used were furnished by Mr. A. E. Brown. The experiments were all made on a Riehle screw-power testing machine of 60,000 lbs. capacity, and had for their objects: first, the determination of the ultimate resistance to shearing of soft steel plate for different forms of punch, and the relation of stress to distortions as the punching proceeded; second, the determination of the effect of the punching on the elastic limit and ultimate tensile strength of the plate in the various cases. In every test the material used was Otis steel boiler plate one-quarter inch thick and stamped 60,000 lbs. tensile strength, the pieces all being cut from the same plate. No analysis was made of the steel, as only relative values of the effect of different punches were sought for.

The different punches used were: the common flat ended punch, both round and square, the centre punch having a small conical centre, the double punch having two steps, and the spiral punch.

Each piece of plate used was 2¼ in. wide and 10 in. long. One piece was reduced in width for several inches near the center, then put in the testing machine and broken by tension, its modulus of elasticity and ultimate strength being carefully noted, also the contraction of area at fracture. A second piece was then placed in the testing machine and cut apart in double shear by a straight die, the ultimate shearing stress and relation of stress to distortion being observed. In all the experiments on shearing and punching, the distortion or sinking caused by the punch was read to thousandths of an inch.

Each of the remaining pieces was in turn put in the machine and a hole punched at the centre of its length and width. After each was in position the indicator was applied and adjusted at zero. The machine was then run until the load reached 2,000 lbs. when it was stopped, the scale beam balanced and read, and a reading taken of the indicator. This was repeated at intervals of about 2,000 lbs. until the punch came through. One piece of the same steel had a hole drilled at its centre to compare with the punched plates. All the plates were then taken to the shaping machine and planed on the edges to remove all cracks due to the original shearing, and also to bring the holes accurately at the centre of the width. They were then again placed in the testing machine and broken by tension, the elastic limit, the ultimate resistance, the contraction of area at fracture, and the elongation of diameter of hole all being carefully determined. In order to determine more accurately the ultimate resistance to shearing for each kind of punch used, 5 to 10 holes were punched with each in similar plate, and an average made of the results. The diagram shows graphically the relation of sinking or distortion to the load applied, for each kind of punch. The irregularities at the beginning of some of the curves may be due to springing and settling of the specimen. One fact is especially noticeable, and that is the entire absence of any yielding or breaking-down point, the curve in each case rising steadily to the maximum and then stopping.

* By C. H. Benjamin, Member Civil Service Engineers' Club, of Cleveland, in the *Journal of the Association of Engineering Societies.*

The numbers on the curves refer to the number of plate as shown in the accompanying Table I.

TABLE I.

No. of plate.	Thickness.	No of punch.	Diam. of punch.	Diam. of die.	Clearance.	Max. load.	Stress (unit).	Remarks.
1	0.266	1	0.750	0.793	0 021	34,520	55,200	Rd. centre.
2	0.266	2	0 748	0.793	0.022	33,000	51,290	Rd. flat.
3	0.273	3	0.786	0.793	0.013	32,690	49.620	Rd. double.
4	0.275	6	0.623	0.660	0.018	28,700	49,610	Rd. centre.
5	0.275	5	0.623	0.656	0.016	33,060	48,150	Sq. double.
6	0 271	4	1.020	1.038	0.009	41,530	47,940	Rd. centre.
7	0 270	8	1.051	1.078	0.018	43,340	48,620	Rd. flat.
8	0.273	7	0.876	0.904	0.014	45.000	47,050	Sq. flat.
9	0 273	3	0.786	0.793	0.013	31.000	47,200	Drilled ½ in.
10	0.263	1	0.750	0.793	0.021	31,400	50,670	Rd. centre.
11	0.273	11	0.750	0.793	0.021	22,700	35,300	Spiral.
12	0.268	....	0.750	.....	.....	.....	.....	Drilled.
13	0.263	....	.....	.....	.....	39,600	49,160	Sheared.

An average of several experiments gives the following results:

TABLE II.

No of punch.	Kind of punch.	Average load.	Average stress.	Remarks.
1	Rd. Centre.	32,430	50,010	Average of 10 trials.
2	Rd. flat.	32,170	49 710	" "
3	Double flat.	33,390	51,460	" 5 "
11	Spiral.	25,360	38,60	" 10 "

Punches Nos. 1, 2, 3 and 11 were selected for a test of average ultimate resistance, as each was three-quarters inch in diameter.

An examination of Table I., will show that, with the exceptions of the spiral punch, there is not much to choose between the punches used, the ultimate resistance being about the same for all. This is confirmed by reference to Table II. It has been claimed that a projecting centre on a punch would reduce the resistance by stretching and bending the metal over the sharp corners of the die before cutting began. The experiments do not show this. In fact, No. 1., in Table I., showed a greater resistance for the centre punch than for any of the others. This is undoubtedly an error since the subsequent trials do not confirm it.

A comparison of experiments 3 and 9 shows a slight advantage in drilling a plate before punching. Experiment 13 shows that the ultimate resistance to punching and shearing is about the same.

The tests do not, however, show plainly the advantage of a spiral punch over all the others, the ultimate resistance being 23 per cent. less in Table II., than the average of the other three. The resistances given in the table are undoubtedly less than when the punches are used in an ordinary press, on account of the much slower speed used and the greater time allowed for the flowing of the metal around the punch. The relative values of the different resistances are probably not affected by this to any great extent.

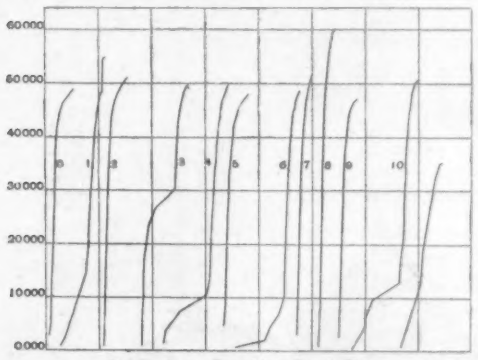
Table III. gives the results of the tension tests of the same plates. These results were very satisfactory with the exception of No. 10, which shows for some unexplained reason a much higher tensile strength than any of the other punched plates, although the same punch was used as in No. 1, and the conditions were precisely the same. I have accordingly omitted No. 10 in comparing averages. The variations in the ultimate strength and

elastic limit of Nos. 1 to 9 are no greater than we often get from different parts of one sheet. Averaging them and comparing the result with No. 12, it is found that the ultimate strength is 7.5 per cent. less, the elastic limit 5 per cent. greater, and the contraction of area 30 per cent. less than in a drilled plate, showing that the effect of the punching is to render the metal around the hole more brittle and less ductile than before. The elastic limit was determined by simply watching the pointer of a lever extensometer attached to the plate, and the values are not as accurate as if the elastic curves had been plotted. No. 12, where the spiral punch was used shows, however, an ultimate strength only 3 per cent. less and a contraction of area only 20 per cent. less than the drilled plate, which offers another excellent reason for using spiral punches.

TABLE II.

No. of Plate.	Maximum Load.	Elastic Limit	Stress. (unit.)	El. Limit. (unit)	Cont. Area.	Elong. Diam.	Remarks.
1	24,600	21,020	61,950	52,940	22	28	
2	23,110	18,400	61,950	49,330	18	24	
3	25,600	20,200	61,230	48,330	21	28	Same punch as 9.
4	26,000	20,480	58,300	45,910	23	..	
5	.....	.....	.....	.....	..	..	
6	19,000	15,050	62,300	49,340	22	..	
7	20,130	15,410	62,900	48,160	19	..	
8	23,270	16,400	63,560	44,800	25	..	Drilled and punched.
9	24,100	19,420	58,930	47,480	19	30	Doubtful.
10	29,130	22,530	65,310	50,510	16	16	Spiral punch.
11	29,500	22,600	64,400	49,330	24	32	Drilled plate.
12	27,800	19,300	66,340	47,070	30	36	Tension piece.
14	35,170	24,220	69,250	47,700	40	..	
Av. of 1 to 9			61,390	48,280	21		

The difference in strength between the drilled plate, No. 12, and the straight piece No. 14 may be attributed to the difference in shape of the test pieces.



Curves from Punching Steel Plate.

It may be said that the variation in clearance between punch and die will always affect the results, but in these experiments we had not a sufficient assortment of sizes to determine how much. Comparing Nos. 6 and 7, in Table I., it is seen that while No. 6 has only one-half the clearance of No. 7, there is no very marked difference in the resistances. The good or bad centring of punch and die has much to do with the result. I think an example of this may be seen in No. 1, as shown on the graphic diagram. It will be noticed that the line of pressure rises higher than the others. The same punch and die were used on No. 10, more care being taken with the centring, and as seen, a different maximum was obtained.

DISCUSSION.

MR. PORTER said that the question of the resistance to punching was not of so much importance; that the practical question was in regard to the effect on the strength of the metal. He said that the trouble with most experiments of this kind was that they did not always reproduce the actual conditions obtaining in practice. He suggested pulling the test-piece apart by means of a pin passed through the hole instead of by gripping both ends, as more nearly representing the conditions under which the metal gives way in actual construction.

MR. GIFFORD said that the reason why spiral punches had not been used was because of the great expense of making them.

It was suggested that the spiral punch would be less apt to crowd over if the spiral were double with points on opposite sides of the punch.

The Baldwin Compound Locomotive for the World's Fair.

It will be remembered that arrangements have been made for the exhibition of two locomotives in front of the railroad terminal station at the World's Fair, these locomotives being placed on pedestals. We illustrate one of these two locomotives in this issue. This engine, which was built by the Baldwin Locomotive Works, it will be seen, is one of the Vauclain compound type, has Wootten firebox and an extra cab for the fireman. The locomotive is shown with a tender in our illustration, but it is probable that it will be mounted on the pedestal without the tender as this would make the foundations rather too long. The weight of this locomotive is 192,000 lbs. and it is therefore the heaviest locomotive of this type so far built, and it is of little less weight than the decapod tank locomotives used in operating the St. Clair tunnel, which were also built at the Baldwin Locomotive Works and described in the *Railroad Gazette* April 3, 1891. The St. Clair locomotives have all the weight on the drivers. This one has 170,000 lbs. on drivers. The cylinders are 16 and 27 in. diameter by 28 in. stroke. The drivers are 50 in. diameter and the truck wheels 30 in., Paige make. The first, fourth and fifth drivers are flanged, 5¾ in. wide; the second and third are plain, 6 in. wide. The driving axles have 9×10 in. journals, and the truck axle 6×10 in. The boiler is steel, ¾ in. thick, butt jointed, with double covering strips, and is 76 in. diameter at smokebox end. There are 350 2-in. tubes 12 ft. long. The firebox is steel, 98×132 in with fire brick arch, and radial staybolts 1⅛ in. diameter, the nine central rows having heads under the crown. There is a water tube grate. The combustion chamber is 36 in. long. The prospective view is from a photograph of a similar engine built for the Erie.

Ships and Shipbuilding on the Great Lakes.

II.

In a previous article attention was called to the magnitude of the shipping interests on the great lakes, and we now give some description of the plants at which these ships have been and are being built. It is safe to say that no one who has not made a tour of the lakes and examined the shipbuilding facilities can form a just estimate of the extensive scale on which "fresh water" ship building is being carried on. At Cleveland, Detroit, Chicago, West Bay City and West Superior there are plants for building steel steamships which are but little smaller and in no way inferior in the character of their equipment to well known shipyards on the Atlantic Coast. In addition to this there are smaller shipyards in which steel ships are built at Buffalo and Toledo, to say nothing of many yards for the construction of wooden ships, but which are not equipped for steel shipbuilding, some of the largest of which are located at Port Huron, Milwaukee and West Bay City. In addition to these there are dry docks of various sizes scattered all along the lakes, the largest and most important being located at Buffalo, Cleveland, Detroit, Port Huron and West Superior, the last being the latest and largest.

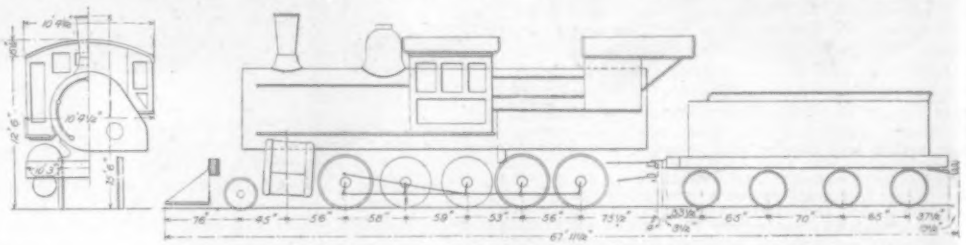
Buffalo.—The oldest and most widely known shipyards and engine building works are naturally to be found at the oldest cities and on Lake Erie. Of these the yards of the Union Dry Dock Co., at Buffalo, although, from the nature of the surroundings, occupying but small space compared with some of the younger establishments, have a high reputation for excellent work and have built some famous ships. At the present time the metal shipbuilding plant is being moved across the street to the space directly adjacent to the dry docks, and no new work is in hand. The steel steamer "Codorus," which is 290 ft. long over all, 275 ft. keel, 40 ft. beam and 26 ft. molded depth, was recently built at this yard. Among other widely known steamers built by the Union Dry Dock Co. may be mentioned the sister ships "Chemung" and "Owego" of the Union Steamboat Co., which are 350 ft. 7 in. long over all, 324 ft. 10 in. keel, 41 ft. beam and 25 ft. 6 in. molded depth. They have triple expansion engines and Scotch boilers. There are two dry docks at this yard which are 343 ft. long on the keel blocks, 44 and 48 ft. wide at the gates, and 10½ and 15½ ft. deep on the sills, respectively. Near the Union Dry Dock Co.'s yard is the dry dock of the Mills Dry Dock Co.

The engines and boilers for ships built at Buffalo have been generally made by the King Iron Works and the Lake Brie Boiler Works. Both of these works are well equipped for heavy marine work. The shops of the King Iron Works strongly resemble in general character and architecture some of the older marine engine shops on the Atlantic Coast and like them have given abundant evidence of their ability to turn out high class work in spite of inconveniences in the way of lighting, etc., which do not exist in modern shops. An important part of these works is the foundry, in which propeller wheels are made a specialty. "Trout" wheels are famous on the lakes and it is safe to say that more propellers, spare wheels, etc., can be seen in the yards of the King Iron Works than at any other place in the United States.

The Lake Erie Boiler Works is provided with modern tools, hydraulic hoists, riveters, etc., for the rapid handling of heavy marine boilers. Adjacent to the boiler works and in reality part of the same establishment is the Lake Erie Engineering Works which is a thoroughly modern plant for foundry and machine work and is equipped with heavy first class machine tools, travelling cranes, etc. The machine shop is of the gallery type with spacious erecting floors.

Cleveland.—As a shipbuilding locality Cleveland is second only to the Clyde as shown by statistics. Its prominence in ship construction is not surprising when the works of the Globe Iron Works Co., the Cleveland Ship Building Co., and the Cleveland City Forge & Iron Co., and the dry docks of the Ship Owners' Dry Dock Co., have been visited. The Globe Iron Works Co. has two distinct plants one being the shipyard and the other the engine and boiler works. The shipyard has a frontage of 1,400 ft. upon a branch of the Cuyahoga River. There is therefore space to build four ships of ordinary size at a time, all of them being placed in line, parallel to the water's edge. The shipbuilding shop is well equipped for metal shipbuilding, and as they have an excellent set of sheers of 100 tons capacity, which we illustrate in this issue, they are well equipped for handling heavy machinery. There have been built at this yard in the neighborhood of 32 large steamers. At the present time the works are engaged upon the two passenger steamers for the Great Northern Co., which have been already mentioned, and upon repair work. The steam yacht "Comanche" which is intended for ocean service has just been completed. This yacht was built complete at these works including the joiner work and furniture, and is altogether as completely a furnished and handsomely finished steam yacht as we have had the pleasure of examining.

A Baldwin Compound Decapod.



Baldwin Compound Locomotive for the World's Fair.

The machine shop, foundry and smith shop of the Globe Iron Works Co., are located some distance from the shipyard and are near their dry dock. These shops are necessarily not of the latest type of shop construction, but have been remodeled and extensive additions have been made so that they are thoroughly equipped in all departments for the manufacture of marine engines and boilers of large capacity. Among recent interesting work turned out by the Globe Iron Works are two ships for the lighthouse establishment. The following ships have been finished at these works during 1892, or are now building: Two screw steamers for the U. S. Government for the lighthouse department, which are 155 ft. long and are fitted with compound engines, one of which is stationed on the Maine coast and the other on the Pacific coast; a steam yacht 186 ft. long intended for ocean voyages, which has triple expansion engines having cylinders 14, 23 and 36 in. in diameter by 24 in. stroke; the steamer "Samuel Mitchell," which is 309 ft. long and has triple expansion engines having cylinders 24, 38 and 61 in. in diameter by 42 in. stroke; the steamer "Schuylkill," for the Lake Erie & Western Transportation Co., which is of about the same dimensions as the "Mitchell"; the steamer "Mariposa," for the Minnesta Steamship Co., which is 348 ft. long over all, 330 ft. keel, 45 ft. beam, and 24 ft. 6 in. deep. The three boilers for this ship are of the Scotch type, 12 ft. x 12 ft., and are intended for 175 lb. working pressure. The

engines are triple expansion and have cylinders 24, 39 and 63 in. in diameter by 48 in. stroke. The capacity of this steamer is 4,000 tons on a draft of 16 ft. To this list must be added two fast passenger steamers for the Northern Steamship Co., which are to be 380 ft. long over all, 360 ft. keel and 44 ft. beam.

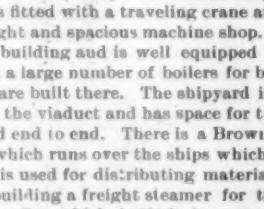
The Cleveland Ship Building Co., which succeeded the Cuyahoga Steam Furnace Co. in Jan., 1887, has a particularly interesting plant as it is located on both sides of and under the viaduct which connects the two principal portions of Cleveland, and occupies the space under two of the arches. The building used for offices, pattern shop, store-room and light machine shop is built facing one of these arches and close to it. The opposite end of this arch is enclosed with glass, and the space under the arch forms the erecting shop and machine shop for heavy work. This is fitted with a traveling crane and makes a remarkably light and spacious machine shop. The boiler shop is a new building and is well equipped with modern tools, and a large number of boilers for both marine and land use are built there. The shipyard is on the opposite side of the viaduct and has space for two ships at a time, placed end to end. There is a Brown traveling crane in use which runs over the ships which are on the stocks and it is used for distributing material. At this yard is now building a freight steamer for the Bradley Transportation Co., which is 324 ft. long on the keel, 42 ft. beam and 24 ft. 6 in. deep. This ship will be fitted with twin screws and triple expansion engines, having cylinders 24, 38 and 61 in. in diameter by 42 in. stroke. There is also building a single screw steamer of the "Monitor" type, which has about the same general dimensions as the steamer just mentioned. The frames for this ship are very closely spaced, giving it a remarkably heavy and strong appearance. Among other ships recently built by this company are two monitors for the Lake Superior Iron Co., which are 266 ft. keel, 38 ft. beam and 24 ft. deep. The Cleveland Ship Building Co. also builds a large amount of machinery for ships built elsewhere on the lakes, and for other uses. Recent work in this line includes six boilers for the whaleback steamer for World's Fair passenger service which is now building at West Superior, four boilers for ships built by Jas. Davidson, at West Bay City, and a blowing engine for the Illinois Steel Co.

Other establishments at Cleveland which should be specially mentioned in this connection are the works of the Cleveland City Forge & Iron Co., which has a national reputation for excellent work in heavy forgings for all purposes, and the Ship Owners' Dry Dock Co.'s two large dry docks.

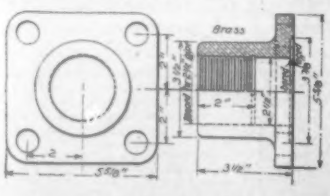
Toledo.—At Toledo is the shipyard of the Craig Ship Building Co., some distance from the centre of the city, on the east side of the river. This is a comparatively new plant, which is as yet hardly in full working order. The company has been at this yard but three years. The tools and equipment are necessarily new throughout, and are sufficient for metal and wooden shipbuilding, but the company does not build boilers or engines. It is at this yard that the two transfer boats for the Toledo, Ann Arbor & North Michigan, which are to be used for transferring cars across Lake Michigan are being built. These boats have already been described and illustrated in the *Railroad Gazette*. One of them is now very nearly completed, and work is well advanced on the second. The yard has sufficient frontage and ship space for building six boats at a time. Among other work recently turned out is a steel river boat, with stern wheel, for use on the Mississippi, which is 140 ft. long, and a sandsucker dredge 150 ft. long by 30 ft. deep. The keel is laid at this yard for a fire tug for the city of Detroit.

Blow-Off Valve, Wabash Railroad.

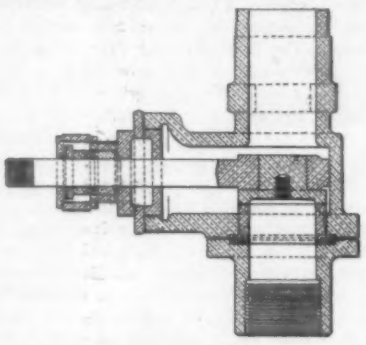
Among the many novelties which Mr. J. B. Barnes, Superintendent of Motive Power of the Wabash Railroad has introduced is a blow-off valve, which we illustrate herewith. The entire valve and casing is made of



brass. The valve casing is screwed into the side sheet of the firebox near the bottom of the water leg and near the middle of the length of the firebox, so that it clears the driver brakes. The valve is operated by means of a lever which is conveniently placed above the running-board. There is a valve on each side of the engine.



It will be seen that the valve and seat can be readily removed for examination, returning or grinding without unscrewing the valve casing from the boiler sheet or disturbing the lever connections. As all parts of the valve and seat are circular, it can be very readily and cheaply finished and returned when necessary. It is apparent from its form that the valve is kept pressed to its seat by the water pressure in the boiler. This valve is used on the latest design of Wabash engines for fast passenger service, known as Class "F." These engines are of the American type, and have 18 × 24-in. cylinders, 69-in. driving wheels, and weigh 99,000 lbs. in working order.



The Positive Lock Washer.

This is a new nut lock made by the Positive Lock Washer Co., of Newark, N. J., which has had a number of months of experimental but very satisfactory service. It will be observed that it is a variation of the familiar Verona type. The idea of having a sharp point to cut into the metal of the angle plate and of the nut, so as to prevent the nut turning back, is not new, but the new features claimed are making this point of the form which is shown, making the washer of steel, oil tempered, so that it will not lose its efficiency by wear, and reducing the thickness of the washer near the ends, to leave play for vibration. Shop tests that we have seen, and examples taken from actual service in track, show that the points not only engage deeply in the metal of the joint and nut, as illustrated in the cuts, but that after repeated

Fig. 1.

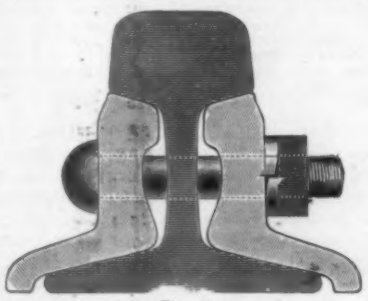


Fig. 2.

reversals of the nut and screwing it up again, with the same washer, the points remain uninjured and entirely efficient. Two sketches from actual examples are shown herewith. Fig. 4 shows a nut taken off a joint that had been in use some six months on one of the large railroads entering New York. Fig. 5 shows a nut that had been

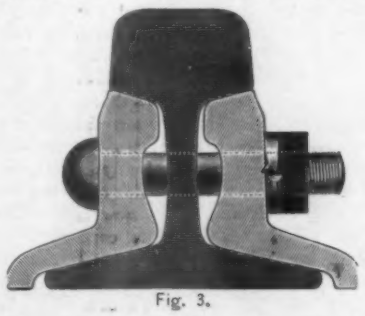


Fig. 3.

screwed up and taken off in the shop. The indentation made by the chisel point is a good deal cut away in backing the nut off.

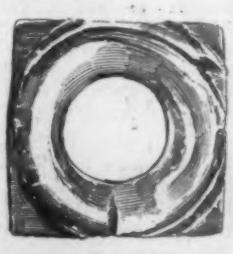


Fig. 4.

One defect of the spring washer type of nut lock is of course the liability to overload the spring to such a degree as to entirely destroy its elasticity, when it becomes simply a flat washer, and its use as a lock is then lost. In the case before us, even where the spring quality is entirely lost, the barbs would act to hold the nut in its relative position.

It is the purpose of the company manufacturing this nut lock to supply it not only for track work, including frogs and crossings, but for machinery, cars, bridge work and a great variety of uses. In Fig. 1 it is shown in perspective. Fig. 2 shows a section in which the washer has been applied and the points are partly imbedded in the metal by compression resulting from screwing the nut home. Fig 3 shows the same application with the barbs entirely imbedded as the result of the first compression, supplemented by the action of the vibration of the spring in service. The company claims that the provision for vibration mentioned above and shown in these sectional views is a very important modification, in that it will preserve the elasticity of the spring by relieving the ends from the full strain of screwing up the nut with the long lever of the track wrench. It will be seen that there is still play left for the ends of the washer after the nut is screwed home.

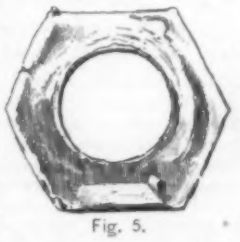


Fig. 5.

The washers are made of spring steel, oil tempered, are reversible, can be used many times, and do not injure the threads of the nut or bolt. It is said that tests have been made with it for a period of nearly four years on railroad track, drop presses and machinery subject to vibration. The company will send samples free of expense on application.

Lake and Atlantic Coast Shipbuilding.

The *Marine Review* publishes the following table showing the number and value of contracts in hand on Nov. 1, for the seasons mentioned, at the lake shipyards:

Winter of	Number of boats.	Capacity, gross tons.	Valuation.
1886-87	31	65,750	$4,074,000
1887-88	60	108,525	8,325,000
1888-89	59	100,950	7,124,000
1889-90	86	124,750	7,866,000
1890-91	38	77,950	5,337,000
1891-92	45	76,000	4,895,000
1892-93	49	68,470	6,909,500
Total	338	632,395	$44,531,500

Since the date mentioned a contract has been closed with the Detroit Dry Dock Co. for a steel freighter, which will carry 5,000 tons of cargo through the 20-ft. channel when completed. Of the vessels building this year 10 freight steamers, 9 passenger steamers, 4 barges, 3 government vessels and a yacht are of steel. The vessels are being built in 21 different yards, and six other yards report no contracts. The merchant vessels now building on our sea coast amount to about 35,000 tons, valued approximately at $4,500,000. The United States vessels now under construction have a displacement of about 100,500 tons, valued at $53,000,000. Their names and the places where they are being built are given below:

Name.	Tons displacement.	Builders.
*New York	8,150	Wm. Cramp & Sons, Philadelphia, Pa.
*Columbia	7,475	Wm. Cramp & Sons, Philadelphia, Pa.
Indiana	10,298	Wm. Cramp & Sons, Philadelphia, Pa.
Massachusetts	10,298	Wm. Cramp & Sons, Philadelphia, Pa.
Cruiser No. 13	7,475	Wm. Cramp & Sons, Philadelphia, Pa.
*Texas	6,300	U. S. Navy Yard, Norfolk, Va.
Raleigh	3,183	U. S. Navy Yard, Norfolk, Va.
Amphitrite	3,990	U. S. Navy Yard, Norfolk, Va.
*Puritan	6,060	U. S. Navy Yard, Brooklyn, N. Y.
Cincinnati	3,183	U. S. Navy Yard, Brooklyn, N. Y.
*Terror	3,990	U. S. Navy Yard, Brooklyn, N. Y.
*Maine	6,648	U. S. Navy Yard, Brooklyn, N. Y.
*Monterey	4,048	Union Iron Works, San Francsco, Cal.
Cruiser, No. 6	5,800	Union Iron Works, San Francisco, Cal.
*Monadnock	3,990	U. S. Navy Yard, Mare Island, Cal.
Torpedo No. 2	.....	Iowa Iron Works, Dubuque, Ia.
Cruiser No. 9	2,000	Columbian Iron Works, Baltimore, Md.
Cruiser No. 10	2,000	Columbian Iron Works, Baltimore, Md.
Cruiser No. 11	2,000	City Point Works, Boston, Mass.
Gunboat No. 5	1,050	Bath Iron Works, Bath, Me.
Gunboat No. 6	1,050	Bath Iron Works, Bath, Me.
Harbor Defense Ram	2,000	Bath Iron Works, Bath, Me.
*Practice Cruiser	.....	S. Moore & Sons, Elizabethport, N. J.

*Launched, but not completed.

At present the Cramps are doing nothing except government work, but they expect to commence constructing the fine Inman line steamers shortly, which will cost about $9,000,000 in the aggregate. It is pleasant to see that the steamers we turn out keep up the reputation for speed, which American built vessels have so long enjoyed. The readers of the *Gazette* have from time to time read of the speeds attained by the lake freighters, and now the Newport News Shipbuilding Co. are just turning out "El Rio" and a sister steamer, "No. 6," both freighting vessels, which are to maintain a sea speed of 16 knots per hour, which was a very fair rate for trans-Atlantic passenger service 15 or 20 years ago.

An Aluminum Naphtha Launch.

An aluminum naphtha launch was recently completed at the works of Messrs. Escher, Wyss & Co., of Zürich, Switzerland, and is probably the only one of its kind in existence. Aluminum has been extensively employed in its construction, the hull, anchors, window frames, and all other metal work consisting of that metal, which also has entered largely into the construction of the machinery. The launch is 12 meters (about 39½ ft.) long, 1.8 m. (about 6 ft.) wide, and draws 700 m. m. (about 28 in.) of water. Including its 6 H. P. engine and boiler, and fitted up complete in all other respects, it weighs only 600 kg. (about 3,520 lbs.). This is estimated to be about one-half the weight of a similar wooden launch, and from ¼ to ⅓ the weight of a steam launch of the same dimensions and power. The launch has a speed of about 8 miles.

RAILROAD GAZETTE

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EDITORIAL ANNOUNCEMENTS.

Contributions.—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

Advertisements.—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

At the recent meeting of the Bridge and Building Superintendents' Association at Cincinnati a report was introduced recommending the pit type of cattle guard rather than the surface type. The argument was that the surface type is not only inefficient in stopping stock from crossing, but that it is actually more expensive in first cost and in maintenance than the pit guard. Any discussion of such a report is but threshing over old straw. We believe that so far as regards the two types or classes of cattle guard, the great majority of railroad men have settled down to the decided conviction that a surface guard is the only rational one to use. Its theoretical and practical advantages far outweigh those of the pit type and its disadvantages are far less. The really efficient and economical surface cattle guard may not have been, or it may have been, developed; that we shall not pretend to decide, although there seems to be little doubt that very efficient ones are now on the market. The relative cost of the surface cattle guard may still be too high, but it ought not to be. It is not supposable that a surface guard must cost as much as a bridge over an opening in the track, however short that bridge may be, or that the cost of maintenance need be as great. If the surface guard men are asking too much for their devices the railroad men, of course, have their remedy; that is, to restrict their purchases until the price is brought down; but, as we have said, there is no reason in the nature of things why the surface guard should not be the cheaper. The objections to the pit type of cattle guard are so great and so well known that it is probable that the railroad companies have been willing to pay more for surface guards than the actual cost of manufacture and reasonable profits warranted. Some of these objections are that every pit guard is an interruption to the continuity of the road bed. It makes a shock to rolling stock every time that a train passes on to and off from it. If it is well built and well maintained this shock may not be serious, but still it exists. It is a bridge, the substructure and superstructure of which must be carfully built and inspected and maintained, and if it is of wood, as is very common, it is always subject to the danger of fire, and how terrible this danger is on long lines through thinly settled country is illustrated by the Chatsworth disaster, which is still fresh in the memory of our readers. Apart from this, too, is the danger of stock getting caught in the pit and derailing trains. As opposed to these great disadvantages, we have simply the alleged disadvantages that the surface guard does not stop cattle from crossing, that it has parts liable to be caught by hanging brake rigging or chains, and that it is expensive. Surely such objections will be overcome, and that before long.

Every locomotive runner knows that it is extremely easy to pass an object, say a signal or a switch target, without seeing it. Men who know all the conditions frequently express wonder, not that enginemen run upon so many misplaced switches, but that the cases of disaster from this cause are so few. The strain on the human faculties when required to unerringly perform such a duty as that of keeping a vigilant lookout on a locomotive, is more trying than most people realize, and those who do realize how great it is are apt to be very considerate in their criticism of a runner who is detected in a failure. But though this general truth is so widely recognized, it is noticeable that those who discuss engine running in print always seem to be ignorant of it. The daily newspapers in discussing a train accident due to an engineman's oversight always assume that enginemen, as a rule, are perfect in their office of lookout-man. Every utterance of the *Journal* of the Brotherhood of Engineers on this point implies the assumption that engineers not only are heroes but are heroes all the time. If they ever make mistakes or neglect their duties the editor of the *Journal* does not know it. Perhaps there is no harm in this state of things, but the impression made on the public mind is erroneous. The prevailing view on this subject has come to be so much a matter of course that anything contrary to it is noticeable, and we therefore print below a letter, signed S. H. Terry, recently published in the New York *Tribune*:

. . . For some three years I rode down to my office on the Sixth avenue elevated, getting on at the Ninety-third street station. To avoid the drafts in winter I took the forward car, occupying, whenever it was vacant, the forward seat on the side the engineer sat in his cab. It became of interest to me to notice the varied attention different engineers gave to their duties. While the most of them by the direction of their faces were on the alert for danger, looking straight along the course before them, . . . occasionally one was found whose eyes were directed to the houses and passers-by on the sidewalk almost continuously from the time one station was left till the next was reached. These seemed to have such familiarity with the landmarks approaching the stations that they knew when a block or two away to turn their gaze toward the station.

It was not uncommon to see one whose attention was so attracted by something on the sidewalk that, with head and shoulders out of the side window, he was noticing something a block back. I recall one instance of this when the engineer's continuance in this position was persisted in till the platform of the approaching station shut out his view. When an engineer allows himself to be diverted from his work in this way it is not strange that he fails to see danger signals, or a train just before him, which he expected would have left the station, but which has come to an unusual stop. . . . This disposition of otherwise good and intelligent men to allow themselves to be diverted from the work in hand is a very common one where their work is in the open air with scenes of interest all around them. . . . Only a little observation is needed by those in authority to single out such as have this failing. . . . If they do not reform others should be put in their places.

As we said above there is nothing new in this to railroad men. But, the facts being acknowledged, Mr. Terry and other passengers will doubtless ask why such careless men are not singled out, and either reformed or discharged. We fear the "singling out" process would show that the word "single" lacks appropriateness in this connection. The superintendent would find not only that this mental failing afflicts a great many enginemen, but that he would find it very difficult, if he took charge of an engine, to avoid exhibiting the same failing himself. But we have not spoken in this strain for the purpose of apologizing for the existing state of things, nor do we mean to say that it is irremediable.

We have many times indicated the appropriate measures for correcting the habit of inattention on the part of enginemen, but those to whom we would address our preachments seem to be satisfied to let matters run on as they are. The fact that an engineman who is negligent in looking for signals thereby risks his own life seems to be held by most superintendents to be a sufficient safeguard against any dropping of the standard of vigilance below what it is now; and everybody seems to think that it is now about right at least so far as his own road is concerned. But it ought to be humiliating to think that in a matter involving the safety of human life, our practice is such that we can take lessons in vigilance from those who merely protect property. Wheelmakers and boilermakers strive for perfection because they will suffer financially if they fall short. A factory owner disciplines his watchmen, by mechanical means if necessary, so that if they drop a stitch the fault is detected. This simple principle must be applied to locomotive runners if we are ever to cure the habit of overlooking signals. And we refer now more particularly to those phases of the question which are applicable to most of the engine-running on every road. We do not mean derailing switches, audible signals and such like devices, which are costly and in many cases impracticable. The most generally available means of improvement is to give enginemen more *practice* in *systematic* observance of signals. The reason that the observer quoted above found most of the runners on the Elevated to be good look-outs is that they have a good deal of looking out to do, and that, therefore, if they have even a moderate endowment of mental qualities requisite for their position, they train themselves to habits of precision. The "average" engineer who, instead of 20 rods, runs 20 miles without encountering a signal must get the elevated runner's practice by means partially artificial. The road foreman must test him in such ways as will show him his weak points. Whenever an engineman runs past a danger signal, it turns out, in a majority of cases, that he has practiced some habit contrary to the rules *for a considerable time*, and the superintendent or other officer concerned can see that if he had watched his men with sufficient care he would have suspected the fault. Such suspicions ought to be carefully followed out and their correctness proved or disproved. The rule requiring firemen to observe signals and check the runners seems to be slowly growing in favor. It ought to grow in favor much faster. On long and easy runs, where supervision is largely impracticable, and the runner's systematic observance of the rules depends on his sense of honor, that sense ought to be cultivated. While this implies a task that cannot be completed in a day, it is well to remember that a little carelessness in administering punishment may do much in the opposite direction—toward killing out honorable impulses in a man. While no fault should escape attention, and no occasion for reprimand be ignored, actual suspension or fine should be imposed only to such extent as is pretty sure to benefit the culprit. All the details here recounted, and others of the same nature, can be changed from the abstract to the concrete by paying a few premiums. The engineman surest to keep his eyes straight ahead and his mind on his work is the one who desires, for his own credit, to make a good record in that respect, and a little money paid in premiums will do much to stimulate earnestness in that line. But no premium should ever be paid to a man who has not been closely watched. Mere freedom from disaster receives too much commendation already.

Yardmaster Rupp, of Philadelphia, who was concerned in the fatal collision on the Philadelphia & Reading, near West Manayunk, Oct. 24, has been arrested on a criminal charge and held in $1,000 bail. He was arrested in consequence of the finding of the coroner's jury, printed below,* and that finding, so far as it concerns Rupp, is based on the testimony of the general and the division superintendent, who said that they regarded him as the man at fault. The substance of their testimony, as we understand it, is that the regulation under which Rupp claimed general power to order trains wheresoever he pleased, within a certain district, was, in fact, only a precautionary measure; it simply said that trains must not cross from one main track to the other without the yardmaster's consent. This change in the situation makes it pertinent to inquire what the practice has been in the past. The fact that Rupp must be consulted by others before they use the track implies that he has some authority to use it himself. If the previous testimony was correctly reported the main fault lies in the *system*, which lacks well known safeguards, and in the ill-qualified agent or operator at Pencoyd. Rupp received an order from Reading to hold the track for the southbound passenger train; he received it an hour or more before the passenger train would reach him and he therefore took the liberty to send the freight one station (two miles) further north, first seeing that a flag was put out to hold the passenger at Pencoyd until the freight got there (and that was done). He evidently did not use the best phraseology in his telegraphic orders, but he appears to have been guided by the general standard in vogue on the road, and therefore will hardly be regarded by the courts as a criminal. While the jurymen seem to have accepted the officers' view sufficiently to name Rupp first, it will be noticed that they nevertheless put the emphasis of the blame just where it belongs, on the person or persons responsible for not using the duplicate order system in sending meeting orders by telegraph.

* "The said collision was due to the carelessness of John R. Rupp, yardmaster at West Falls, in disobeying order No. 54 from Reading, which order he received at 7:46 o'clock on the morning of said date, and we hereby censure the said railroad company for not having a check on the said yardmaster in case he would either disobey or misconstrue the said order, said check to be in the form of an order issued from Reading to all stations south of Conshohocken, as follows:

"'Trains Nos. 2 and 32 and engine "Ariel" will run on the northbound track from Conshohocken; hold all trains and engines after engine No. 1019, train 27, passes north.'

"And we further censure the railroad company for running green crews, as was the case with engine 588."

Concerning Maintenance of Way.

It is a common assumption that the care of railroad track does not get the same intelligent attention that is given to other divisions of the operating expense account. This notion is expressed by various people and in various ways.

The roadmasters in their conventions talk year after year of the difficulties of getting good laborers and good foremen; and one who gets at the undercurrent of their talk learns that they think that their perplexities are largely, almost entirely in fact, questions of wages. They cannot pay enough to get good workmen, and especially to get and keep men whom they can promote to section foremen. If they could pay a few cents a day more they could have picked men; but the managers look at the track as the first place to economize. The regular force per mile must be squeezed flat and then squeezed flatter still when a special economy is to be made. The current wages paid must be just enough to attract the average Hungarian, Italian or negro laborer. The Irishman is drifting to better paid and steadier work. The result of this policy is costly in the end. Rails are destroyed because they cannot be kept tamped up to good surface and because joint ties get down and bolts loose. Roadbed gets soft and banks slide because ditches cannot be kept open. Washouts come because culverts get choked. Wrecks happen because of rotten ties or loose spikes or burned or rotten culverts, cattle guards or trestles; or because ignorant, stupid or lazy trackmen do not flag trains. In fact, there is a long list of items in which the bad economy appears of sparing at the spiggot to spend at the bung. Such we say is the common undercurrent of talk among roadmasters when they gather at their conventions, though little of it gets into the official reports of their doings.

The paper by a maintenance-of-way engineer, which appears on another page, is on the same lines. His argument is briefly that trackmen are not only about the poorest paid men on a railroad, but that they are paid about the lowest rate in the neighborhood in which they work; that, as a necessary consequence, they are deteriorating, as a class; and that their average quality can be improved by means which he suggests.

Another recent writer, Mr. Benjamin Reece, in papers which have appeared by abstract in the *Railroad Gazette*, takes a somewhat different line of argument. His ground is that for various reasons the cost of renewing ties has increased far more rapidly than the cost of renewing rails; but he does not attribute this to the low intelligence of the trackmen so much as to the indifference of the officers of the railroads in inspecting new ties, in taking care that the ties are not taken out of the track until their full life has been got, and, in brief, the neglect of obvious means to meet the conditions of dearer timber, greater wheel weights and faster speeds. His figures are so striking that some of them are worth reprinting. They show the proportion which the renewals have borne to rail renewals in various periods and various places. The figures in the columns under the dates show what per cent. the cost of tie renewals was of the cost of rail renewals.

	1880.	1884-85.	1885.	1887.	1889.	1890.	1891.
Michigan	42	100	172	130	197	153	...
Iowa	..	102	...	...	...	...	194
	1878-81.	1883-85.	1884-86.	1886-89.	1887-89.	1890-91.	
Union Pacific.	37	115	..	195	..	206	
U. P. system	..	..	140	..	201	279	
Santa Fe	..	..	67	..	174	255	
Northern Pacific.	144	158	..	730	..	398	
St. Paul	..	..	80	..	141	200	
Northwestern	61	101	..	143	..	224	
Lake Shore	80	172	..	138	..	111	
Mich. Central	42	133	..	148	..	125	
Louisville & N.	..	47	..	102	..	216	
R. & Danville	40	52	..	117	..	242	
Phila. & R.	..	73	..	98	..	289	

Now we are prepared to believe that the railroads would as a whole find economy in a more intelligent regard for the track department. It is quite possible, and indeed it is probable, that better wages, better ways of educating section men, and especially section foremen, more men to the mile, and more scientific methods of selecting and taking care of ties would bring around an actual saving in maintenance cost, not only of track, but of rolling stock.

All this is probable as a generality, for it is not likely that the art of taking care of track is complete and sealed up; it is probable, too, in particular, from actual observation of individual roads; but it is hard to prove. Averages are not worth much in the case. The only thing to do is to study the course of operating expenses on individual roads and see how the aggregate on each road has varied with the condition of the track; whether or not the expenditures on maintenance of way were liberal and skillful, and whether or not liberal and *skillful* expenditures on maintenance of way really decreased the sum of the operating expenses. Such an investigation would prove something.

Meanwhile it is interesting to know whether maintenance of way expenses have or have not increased. In looking into this matter one quickly discovers that he has got to hunt up his facts and group them for himself. The Massachusetts Railroad Commissioners have made it easy for us to trace the course of maintenance of way of expenses, and we wish that other statisticians had foreseen our wants with the same intelligence. The following table gives the total operating expenses per train mile, the maintenance of way expenses, and the percentage which the last is of the total. The Commissioners subdivide the maintenance of way item into road (including new ties), bridges and new rails, but we take only the total. The fourth column shows the ratio of the third to the second. The values in the second and third columns are expressed in *cents per revenue train-mile.*

	Op. exp.	M. of way.	Per cent.
1874	121.2	25.8	22.3
1879	97.8	13.4	13.7
1880	102.7	15.0	14.6
1881	108.0	16.8	15.5
1887	111.1	16.0	14.4
1889	109.0	16.8	15.4
1890	109.3	14.6	13.4

The 1874 report contains a specific item for maintenance of buildings which has been deducted to give the 25.8 cents above, as this item is not specified in the later reports. It may be included, however. The noticeable thing in this table is the stability of the maintenance of way element. It varies surprisingly little either in absolute cost per train-mile or relatively to the total of operating expenses.

When one tries to get similar figures for the whole United States he quickly finds that he has a tremendous job of investigation the result of which will probably not be worth the labor. The reports of the Interstate Commerce Commission make the maintenance of way charges 22.6 per cent. of the operating expenses in 1888, 22.46 per cent. in 1889 and 22.06 per cent. in 1890. But they go back no further. The operating cost per train-mile in 1889 is given as 94.9 cents and 96 cents in 1890, therefore the maintenance of way cost is 21.31 cents per train-mile in 1889 and 21.12 in 1890. The operating expenses are less and the maintenance of way item considerably more than in Massachusetts. The Tenth Census reports the maintenance of way charges for 1880 as 24.3 per cent. of the operating expenses. By comparison with the figures of the Interstate Commerce Commission there has been a slight reduction in the proportion of this item to the whole. The Tenth Census also gives the maintenance of way cost as 22.02 cents a train-mile. The sum, therefore, of this investigation is that the maintenance of way item has remained nearly constant for the last 10 or 12 years, or has declined very slightly.

Train Collectors Unprofitable.

President Tracy, of the Ohio & Mississippi, is making heads fly in the reduction of expenses, and scarcely a day passes that a dismissal or two is not made. In one fell swoop the expenses were reduced $21,000 a year by discharging all the ticket collectors on the passenger trains. The conductors will collect fares on the trains, just as they did several years ago. It was charged at the time the collectors were put on that it was done owing to the dishonesty of the conductors, but the reports of the collectors showed no more cash fares than those that used to be turned in by the conductors. . .

The foregoing note is taken from a paper published at a town on the line of the road named. The details may or may not be correct, and the alleged reason for discharging the collectors is probably guess-work, but the main fact, that it is deemed profitable to get along without these men, will be of interest to a good many managers and superintendents. Many thousands of dollars have been spent in employing collectors in the United States during the past five years and there is a widespread desire to see what justification there is for the expenditure.

Those roads which have employed collectors have in every case, so far as we can learn, done so for the purpose of increasing the gross receipts from cash fares. The argument about relieving the conductor of a part of his work so that he can better perform the remainder always has a hollow sound. But whether losses be attributed to dishonesty or to carelessness, the argument of those who do not employ an additional man as collector is, that after a time the new men will be as careless or dishonest as the old. Inasmuch as a conductor can lose or steal $75 a month (the amount usually paid to collectors), and still be as profitable to the company as a collector, this argument certainly ought to prevail, for its opponents are at that much disadvantage. The only logical and permanent argument in favor of the collector system is that each man can be selected solely for his fitness as a collector, whereas under the ordinary system the superintendent has to try to find a suitable collector among a limited number of freight conductors or baggagemen, who probably came into the employ of the road without very sharp inquiry as to their ability to pick out a dozen way station passengers in a fully loaded six-car train, or as to their standards of moral rectitude. More care in selecting men for these lower grades seems to be about the only feasible change in practice that offers much hope of improvement. There is room enough here, certainly.

After selecting the best men that are believed to be available, the only way to deal with them is the way adopted by the government and other large concerns, whose theories of management, are strictly business-like, in dealing with fiduciary trusts — that is, assume that all men will be careless if not dishonest. This is the rule, from the Treasurer of the United States down to the Postmaster handling $100 a year, and bonds are required of them. In the application of this rule to fare-collectors the old custom of employing secret inspectors—disguised watchmen—has the argument in its favor. It takes advantage of the principle that a person who thinks he is watched will be as careful as though he were watched in reality. If a collector is hired to constantly watch a conductor or a conductor to constantly watch a collector, there is still the need of a secret inspector to see that these two perform their duties faithfully. But the first essential in a watchman or inspector is trustworthiness, and the neglect of this in hiring detectives, is the cause of much of the dissatisfaction with the present system. If an honorable superintendent hires honorable men to watch his conductors, he ought to be able to get a fair idea of the conductors' methods for a good deal less than $900 a year for each conductor, which is what a collector costs. Even if the cost comes quite up to the amount named, he will still probably be better off than with collectors, for he will be doing something to cure a deep-rooted evil and probably all the time trying to do more.

We have not written the foregoing paragraphs with a view to providing our readers with a ready-made scheme for abolishing this well known disgrace to American railroads. We realize the obstacles too fully for that. But in view of the general tendency to apply only superficial or temporary remedies it seems well to turn attention for a moment to the fundamental characteristics of the disease which it is desired to cure, and to point out that this so-called radical remedy, the collector system, comes dangerously near being as bad as the disease, if, indeed, it is not quite as bad. A really radical remedy must reach the primary evils which we have mentioned. We will not now discuss details, for they are well known already. The need is for courage to put them in operation. In passing, however, we will remind those who think that the ticket-receiver system (auditor's assistants at division termini) is adapted only to a road located in thickly settled territory, that the system is giving marked satisfaction on roads in the West, where runs are long and trains infrequent, as well as on the Pennsylvania where it has been longest in use.* This receiver system is regarded by those acquainted with it as an essential element in the proper management of train collections. The use of rebate checks is another essential, at least on the great majority of roads.

The Quick Action Brake in Passenger Service.

It is not generally appreciated, but it is a fact that there are a good many passenger trains on surface roads in this country running without the quick action brake. Of course, the brakes are all automatic, for no one these days would think of running a passenger train with a brake that would not apply of itself in case it were defective, but an automatic brake is not necessarily a quick action brake. A quick action brake applies almost instantly; that is, within two seconds, on a long passenger train, and with full force, which is about 20 per cent. greater than the heaviest braking power that can be obtained without the emergency action. It requires more time than is generally supposed to put the brakes on with the full service application. The difference between the full service brake action and the emergency action is about this: Service brake, full on, 10 to 20 seconds; emergency brake, full on, two seconds; service brake, full on, 50 lbs. pressure in the brake cylinders; emergency brake, full on, 59 lbs. pressure in the brake cylinders. It is just to add, however, that with the old automatic brake the leverage is supposed to be such as to give the same final braking power with 50 lbs. in the cylinder as is given with the new brake and 60 lbs.

These differences are so great that for speeds up to about 15 or 20 miles an hour the emergency brake would stop the train before the service brake is full on. At 30 to 50 miles an hour the difference is considerably in favor of the emergency brake.

*This system was described in the *Railroad Gazette* of March 18 last.

In a recent fatal accident on a prominent road, which attracted much attention and caused considerable comment, the engineer testified that if he had had a very little more time to stop in he could have avoided a serious collision. This happened on a road where the quick action brake is not used, and it was the opinion of some railroad men who investigated the matter at the time that if such a brake had been used there would have been no collision.

One very recent occurrence which shows the value of a quick action brake happened on the Chicago elevated, where the trains are equipped with the latest form of Westinghouse brake. The rules of the road forbid running at a speed greater than 30 miles an hour under any circumstances, but the speed recorder at the time showed that the engineman in approaching a terminal was running at 35 miles an hour. When nearly at the end of the platform he was still running too fast, having misjudged the speed. Not realizing the situation until within a short distance of the bumping post, he did not apply the brake before with sufficient force; but he then put on the emergency brake and struck the bumping post without doing any material damage and without attracting the attention of the passengers on the train. The value of the emergency feature was clearly stated in a general order from the General Manager of the road recounting the circumstance, and announcing the punishment of the engineer, in terms about as follows: "Had this train been equipped with the brakes used on all other elevated railroads in this country (European suburban roads use automatic, quick-acting brakes) there is no room to doubt that this reckless or careless running would have been followed by serious consequences."

There is no feature of action of the brake that gives any good reason for not using it on passenger trains, and any railroad official who consents to its disuse is not only taking dangerous risks but is not dealing fairly with the public.

The Recent Disasters on the Lakes.

It is generally believed that the loss of the steamer "W. H. Gilcher," following close after that of the "Western Reserve," will have an important influence on the character of naval architecture on the Great Lakes. It seems to be a general impression that both of these ships were lost simply on account of insufficient strength to withstand the combined effects of sea and wind in rough weather. In the case of the "Western Reserve," a partial explanation was found in the fact that the ship was light, and consequently the weight of the machinery at the stern and the extra weight at the bow, consisting of topgallant forecastle, windlass, anchors, etc., and the additional weights of the pilot house, etc., made a bad distribution of weights, which tended to hog the ship when without cargo, and that consequently when the bow and stern were thrown out of the water in a heavy sea, a strain was brought on the plates amidships which was greater than they could withstand.

As the "Gilcher" was loaded with 3,000 tons of coal, which is said to be within a few hundred tons of her capacity, the distribution of weights would be quite different, and the ship ought to have been safe, if she would ever be, in a heavy sea. Further than this, there is reason to believe that these steamers were as well built and of as heavy material as any on the lakes, and that if they foundered on account of insufficient strength it is due to the general form of the ships and the general character of ship construction on the lakes rather than to any faulty workmanship or poor material in the ships themselves. The builders of these ships have a high reputation for good workmanship, and an expert who has recently visited all of the ship yards on the lakes states that the strongest ships which he saw in process of construction were seen at the works of the Cleveland Shipbuilding Co., which built the "Western Reserve" and the "Gilcher." It is safe to say at least that there are a good many steamers now in use on the lakes which are of much lighter construction, and which have their frames spaced further apart, etc., than the ships now being built at the Cleveland Ship building Co.'s yard.

It is well known that the average steamer which has been built of recent years for lake service would not be accepted by marine underwriters for sea voyages. As has been pointed out in an article in these columns, these large cargo-carrying lake steamers are very shallow for their length and width as compared with sea-going steamers, which makes them ill adapted to resist vertical stresses. Further than this, the plates, angles and deck beams used in their construction are comparatively light, and there is an absence of longitudinal frames and longitudinal and transverse bulkheads and braces, which is very apparent to any one accustomed to recent practice in the naval architecture for sea-going ships. Added to this there are very large hatches amidships. When all of these facts are taken into consideration it is not surprising that underwriters are reconsidering the question of insurance of lake steamers, and it looks now as if the result of their examination of the question may be a marked increase in the structural strength of lake ships. Of course, as long as it was possible to build light ships, which would necessarily have much greater carrying capacity than heavier ships of the same general dimensions, and to have these ships accepted by the underwriters and insured at ordinary rates, ship owners and builders cannot be blamed for building such vessels.

Division Superintendent A. E. Law, of the Northern Pacific, has been fined $50 at St. Paul, on a criminal charge brought by the State Labor Commsssioner, in consequence of a fatal collision which was caused by the forgetfulness of a conductor and an engineer who had been on duty over 24 hours. The law of Minnesota, chapter 17, 1891, forbids any railroad over 30 miles long to permit or require any conductor, engineer, etc, who has worked 20 hours within a period of 24 hours to again work until he has had eight hours of rest. Exception is made for cases of "casualty" (emergency), and the employment of men by the mile is not forbidden. Any company, officer or employé violating the law is subject to a fine of not more than $100. The collision occurred at Northtown Junction, Minn., Oct. 3. An extra freight met a passenger train and two men were killed. The conductor and engineer of the freight simply "forgot" about the passenger train. The former had been on duty 32 hours, and the latter 28, each with two hours' rest. Both of these men were arrested, but we have not heard how their suits came out. It appears that this crew, after running from Minneapolis to Staples, 131 miles, telegraphed Superintendent Law asking that they be allowed to at once start back with the train; they evidently wanted to make an extra day's pay. It is said that all the men on the train signed the telegram. So far as we can see, the punishment administered by the court is just, though the facts are not reported in sufficient detail to admit of any definite conclusion as to the culpability of Mr. Law, personally; a higher or lower officer may have been equally guilty or the general system may have been such as to introduce mitigating circumstances. Moreover, we do not know whether the men were actually tired, in this case, or not. Perhaps they had taken a good rest in the caboose. The punishment of the Superintendent, however, is very light. It is said that the railroad company will see that an appeal is taken. As has appeared in cases heretofore discussed in these columns, it is incumbent upon a superintendent to guard against *permitting* overwork as carefully as he guards against requiring it. He may possibly ease his conscience, so far as humanitarian considerations toward the trainmen are concerned, by taking care that they ask to be overworked; but his highest motive for restricting the working hours of his men is his responsibility for safely managing his trains. Looking at the case from this point of view we at once see that it is often important not only to refuse the requests of men who are too anxious to increase their pay, but to investigate their habits to see why and when they make such requests, or whether they overwork themselves by changing off with other men without leave.

The *Railroad Gazette* has often emphasized the importance of maintaining good relations with employés. Division superintendents ought to be high class men, ought to be kept, after they get acquainted with their subordinates, until absolutely needed in higher offices, and ought not to have large districts. This question comes up in connection with nearly every strike, but it is generally impossible in such a case to discuss the principles involved because questions of more vital immediate importance overshadow it. Moreover, we generally find every reasonable striker associated with nine or 99 unreasonable ones, so that anything said about treating them better is attributed to the spirit which apparently animates most of the "labor" journals; the spirit which demands favors but does not give any reasons for the demand. Readers are justly impatient of arguments unaccompanied by the evidence of concrete examples, and we presume that there are those who have felt scant respect for our utterances in this line. But occasionally we find a bit of evidence which we can print, and we present one herewith, copied from a Denver paper.

The committee of Denver & Rio Grande engineers and firemen has finished its conference with President Jeffery and the members have gone home. . . . President Jeffery said: "The conferences have resulted benefically to both the men and the company. For several years differences had been growing up, and from one cause and another their adjustment had apparently been neglected and the result was that the men were not in harmony with the management, although I was personally without knowledge of this fact. . . . The interchange of views has been beneficial to both sides." It will be remembered that the Denver & Rio Grande strike was one of the most unreasonable, in its main features, as observed from the outside, that has lately taken place; and yet we see that it has been a means of decided improvement. We do not call attention to this with the idea of giving prominence to this road or its officers, for we have found the same conditions on other roads. But not every officer is so frank as Mr. Jeffery.

The Russian Government has published statistics on the consumption of the different kinds of fuel on the Russian railroads for seven years, ending with 1890. By this it appears that the consumption of wood, which reached 1,482,040 cords in 1881 and 1,653,560 cords in 1883, was only 1,455,240 cords in 1890, the railroad mileage having increased about 29 per cent. since 1881. There was a slight increase in the consumption of charcoal, which, however, has never been important in amount (about 7,075 tons in 1890). Anthracite is used much less than formerly, 177,858 tons in 1881 and 92,178 in 1890; but there is a large increase in the use of the bituminous coal which comes from the Donetz, like the anthracite, and in that from the Ural and Polish mines, and a great decrease in all the imported coal and in that from the Moscow mines which latter affords only half as much heat per ton as good English coal. But the most remarkable increase has been in naphtha, of which 2,088 tons were used by locomotives in 1881, and 317,790 in 1890. Naphtha is reported as equal in heating power to 1.39 times its weight of English coal, which is itself just about equal to Russian anthracite and better than Russian bituminous coal. The naphtha is used chiefly on railroads leading to the Caspian Sea. The weight of naphtha consumed is equal to more than one-fifth of all the coal. In heating capacity the wood used was equal to about two thirds of the coal burned. But the total consumption of all mineral fuel was but 1,840,000 tons in 1890, which, with the 1,455,000 cords of wood, seems very little for 18,000 miles of railroad. One of the fuels used is peat, of which 56,376 tons were consumed in 1890.

Vice-President Harahan of the Illinois Central, in a recent circular to those employés of the road who come in contact with the public, reminding them of the importance of keeping posted as to what is going on in their communities and as to proposed municipal action affecting the road, took occasion to refer to the importance of local newspaper. Among other things he says:

"Newspapers generally are friendly and fair in their remarks concerning this company. My experience is that newspapers published along the lines of this company are well disposed and seldom make harsh criticism, unless such criticism is deserved, which, in the handling of any large business interest, no matter how well managed generally, will sometimes occur. It will generally be found that if the company's agents and local officers will furnish to the press the facts in matters in which the public has an interest, the newspapers will appreciate such, and will refrain from exaggerated or highly colored accounts connected with the company's operations. Many newspapers make such exaggerated reports because they are unable to secure from the proper representatives of the company the actual facts, and are, therefore, compelled to glean their information from persons who are not always familiar with the facts, and who may be prejudiced against the company."

As the circular was not intended for publication there can be no suspicion that Mr. Harahan wrote these words merely for "taffy."

Recent investigations of the progress made in increasing the capacity of German freight cars show that only three railroads have completed the change of their box cars from 10 to 12½ tons (22,000 to 27,500 lbs.), while four companies have ordered 1,092 new box cars of 15 tons 33,000 lbs.) capacity. A much greater number of the railroads (including the Prussian, Bavarian and Saxon state railroads, which have by far the larger part of the German mileage and equipment) have changed part of their stock of *open* cars from 10 to 12½ tons, and have decided to make 15 tons the standard for new open cars. Two companies have changed old 10-ton open cars so as to carry 15 tons, and the Prussian state railroads have as an experiment, built a number with 30 tons (66,000 lbs. capacity. These latter have four axles—that is, they are doubtless made on the American plan, with trucks.

The Long Island road no longer accepts mileage tickets on its trains, but requires the holder to exchange his coupons at the ticket office, each trip, for a special ticket. This will be a decided convenience for the conductors, but we shou'd think the passengers would be likely to grumble, for one of the principal advantages of a mileage ticket is the convenience of not being obliged to go to the ticket office every time one takes a ride. This road has hitherto permitted buyers of mileage tickets to take along members of their families on the ticket, but now will stop this and sell 10, 15 and 25-trip family tickets. These cost the same per mile as mileage tickets and as family tickets are generally used mostly to one place, this change will probably not cause much complaint.

NEW PUBLICATIONS.

Theorie und Praxis des Eisen bahn-Geleises. Von Alois Stane, General Directionsrath der k. k. Staatsbahnen in Wien. 18 plates, and 16 cuts in the text. Vienna 1892. (The Theory and Practice of Railroad Track). 108 pages.

It is somewhat unfortunate for this little book that it followed so closely on the heels of Haarmann's great German work on the same subject, which was reviewed in the *Railroad Gazette*, Aug. 19, as it is apt to be overshadowed by it. This occupies, however, a somewhat different field. Haarmann's is rather an encyclopedia of track material, while the work under review devotes itself exclusively to the consideration of types of track found to-day in service in the different countries of the world. It is divided into three chapters with a preface and a short conclusion. There is a table of contents, but no index.

The first chapter is devoted to, first, a short history of the growth of track construction in different countries, and then to a discussion of the strength of track, and especially of rails, and finally of joint fastenings, the whole chapter taking 75 pages. Chapter II. takes up "the requirements for the resisting power of the track and its component parts," and gives 54 pages to the quality of the materials used and the wear of rails, ties and fastenings, with some closing words on the stiffness of track as a whole. The third and final chapter describes the efforts made for the improvement of the strength of track, under which heading is discussed, first, the effects of intensity and speed of traffic, and then is given a résumé of the means employed in Belgium, France, Switzerland, Germany, Austria Hungary, England and the United States to provide a permanent way of proper resisting power.

As a rule this book will, in this country, interest only those who are investigating what is being done in the way of track construction in other countries, and to them it will be of service. There are, however, a few points which have a bearing on American practice. When discussing track fastenings, the author speaks of the holding power of spikes as follows: "The surface of the shank of the spikes is dependent on the form of the spikes themselves, and in this regard, experiments have shown that if the holding power of a prismatic spike with a square cross section be taken as unity, then the holding power of spikes of other sections will be in the following ratios:

Spikes with square cross section	1.00
" " octagonal "	0.83
" " circular "	0.79
" " triangular "	0.78
" " hollowed sides cross section	0.79—0.91
" " barbs	0.96
" forged like screws	0.94
Lag screws	1.29—1.30

"Experience, however, has further shown that lag screws present certain difficulties in the way of maintenance, so that on the whole a prismatic spike with square cross-section is to be preferred." [These figures do not seem to accord with the statements made by makers of patent spikes in this country, who claim for their devices a much greater holding power than is developed by the common spike.—EDITOR.]

The holding power of spikes in pine is one-half that of spikes in oak when subjected to a direct pull, but as regards the resistance to a side pull, the woods stood in the following ratio:

For a movement of	Pine.	Oak.
⅛ in.	1.00	1.16
¼in.	1.30	1.28
¾ in.	1.00	1.31
1 in.	1.00	1.36

That is to say, against a small lateral movement of the spike oak is only 16 per cent. better than pine, but for a large lateral movement it is 36 per cent. better. It takes about twice as much force to move a spike in a pine tie sideways one inch, as it does to move it one-quarter of an inch.

Experiments have further shown that the impregnation of ties has no effect upon the holding power of spikes; and, also, that spikes driven in reamed holes have the same holding power as those driven in fresh wood; and small though often repeated effects may produce greater crushing than a single great one.

Ties covered with ballast decay slower than those not so covered. The author puts the life of unpreserved ties in Austria as follows, figures which in the United States are not realized.

Oak	12—14 years.
Larch	8—10 "
Fir	7— 8 "
Baltic spruce	10 "
Beech	3 "

Creosoting increases the life of oak ties to 20 years, and larch to 12 to 16 years.

Considerable space is given to American practice, which in the main is both correct and up to date, except the following amusing blunder "On the New York-Albany line of the Pennsylvania Railroad Co., speeds of 69 miles (110 kilometers) per hour are shown."

At the back of the book are five folded tables. The first gives the characteristic dimensions of track material on a number of old European railroads; table II. gives similar figures for more recent practice. Table III. gives rail specifications on 24 different European railroads. Table IV. gives figures on the average changing and wear of rails on tangents and curves for both single and double tracks. Following these tables are 12 plates illustrating rail and joint sections on what can be called standard English and Continental railroads, which types, however, have been illustrated from time to time in the *Railroad Gazette*.

Statistics of Railways in the United States; being the Third Annual Report of the Statistician to the Interstate Commerce Commission. Washington, 1891.

This volume brings the Commission's statistics up to June 30, 1890; that is, the statistics published are two years and four months old. The volume is considerably increased over the second report, this one containing 984 pages. In this report the Statistician has introduced for the first time his scheme of territorial grouping which was described in the *Railroad Gazette* some months ago.

Transactions of the American Society of Civil Engineers, September, 1892.—This issue contains six papers and discussions on them. The latest of these papers was read before the Society Sept. 21. It will be seen, therefore, that the Society is gradually catching up in publishing papers, and it is to be hoped that the present scheme of publishing papers within a month of their reading will be carried out. The papers in this issue are: Wind Bracing in High Buildings, by Mr. Quimby; Rainfall Flow of Stream and Storage, by Mr. Fitzgerald; Tests of an Electric Street Car Motor, by Mr. Bonnett; Motive Power for Street Railways, by Major Sears; Protection of an Iron Tunnel Roof, by Mr. Dragon; and Strength and Weathering Qualities of Roofing Slates, by Prof. Merriman.

Proceedings of the Engineers' Club of Philadelphia, October, 1892.—The papers in this issue are: Evaporation by Multiple Effect, by Mr. Muller; Recent Experiments on the Flow of Water Over Weirs, translated from Bazin by Messrs. Marichal and Trautwine; Influence of Rainfall on Commercial Development, by Mr. Readway; Mississippi River Improvement, by Capt. Leach, and Yearly Tides, by Mr. Auchincloss.

TECHNICAL.

Manufacturing and Business.

The Central Iron & Stéel Co., of Brazil, Ind., is building extensive additions to its works, increasing the size of the buildings by one-half. The company is now running to its full capacity, which is 75 tons a day, divided between turnbuckles, car axles, railroad spikes, forgings and bar iron. Among the proposed additions to the plant is a bolt, nut and rivet department.

The Curtis Regulator Co., formerly of 63 Beverly street, Boston, has removed to 29 Haverhill street, where it has extensive sales rooms and offices in a new building of five stories and basement, measuring 75 × 45 ft. The new factory in Charlestown is of substantial construction, with heavy brick walls. It measures 105 × 45 ft., and is five stories high. It is supplied with a 100 H. P. Ball high speed compound engine and a locomotive boiler, its own dynamo and electric lights. A track of the Boston & Maine runs into the premises. With these facilities the Curtis Regulator Co. is prepared to accept orders for high class machinery work. It has been engaged in this line of business for upward of 14 years.

The Van Dorston Cushioned Carrier Iron and Railway Supply Co., was reincorporated Nov. 1, 1892, with a capital of $1,000,000 and the name of the company was changed to that of the Van Dorston Railway Supply Co. The new company is now ready to proceed with the introduction of several railroad appliances covered by patents. The Van Dorston carrier iron and continuous double acting draw-gear is expected to add important elements of efficiency to M. C. B. couplers for heavy freight service. The carrier iron takes the place of dead blocks and affords protection to couplers of any kind, while the continuous double acting draw-gear distributes the draught stress upon both ends of the car at the same time, thus adding 50 per cent. to the service of draw-gear alone.

The Fontaine Safety Signal Co., of Detroit, has increased its capital to $750,000.

The capital stock of the New York Car Wheel Works was increased by $200,000 at a meeting held by the directors last week.

Mr. F. M. Canfield, train dispatcher of the Erie road at Meadville, Pa., has taken the position of General Agent of the Mozier Safety-Signal Co., of Galion, O., with headquarters at Cleveland.

The Dunkirk Engineering Co., of Dunkirk, N. Y., was last week incorporated at Albany, to manufacture and repair locomotives, boilers, engines, general machinery and implements. The capital is $51,000 and the directors are George M. Newton, William Bookstaver, Elizabeth Newton, of Dunkirk, Charles F. White, of Chicago, and Philetus C. West, of Fredonia. The company has been organized for several years.

A charter has been issued by the Secretary of State of West Virginia to the Coles Flue Expander & Beader Co., with a paid up capital of $185,000. The company will erect a factory at Harper's Ferry, W. Va.

The Barr Wheel & Foundry Co., of Chicago, has been incorporated, with a capital stock of $100,000, to manufacture car wheels and to do a general foundry business. H. R. Walker, J. N. Barr and others are the stockholders.

John P. O'Donnell has been engaged as Consulting Engineer by the National Switch & Signal Co. Mr. O'Donnell designed the Waterloo station switch and signal system in London.

Articles of incorporation have been filed at Little Rock by the Eubank Car Door Co., with a capital stock of $100,000. The officers and directors are W. T. Kelley, President; Thomas Eubank, Vice-President; Maurice W. Clark, Secretary; Mord Roberts, Treasurer. Mr. Kelley is Superintendent of the St. Louis, Iron Mountain & Southern road.

Iron and Steel.

The Colorado Fuel & Iron Co., is getting the steel works in Pueblo, Col., in shape to operate all three of its blast furnaces, one having stood idle since built a year ago.

Nimick, Jack & Tyson, proprietors of the Cold Rolled Steel Co., have decided to locate at Kensington, Pa., and will erect a main building 200 x 100 ft., beside smaller buildings, the entire plant costing about $75,000.

The new plant of the Shenango Valley Steel Co., at New Castle, Pa., went into operation last week.

Ground has been broken for the erection of the new Bessemer plant of the Ohio Steel Co., at Youngstown, O. Julian Kennedy, of Pittsburgh, is Consulting Engineer for the firm, and the plant will be erected under his supervision.

New Stations and Shops.

The Norfolk & Western has staked off the ground for a passenger and freight station at Williamson, Logan County, W. Va. The building is to be 37 × 64 ft. and two stories in height.

Work has been recommenced on the new union passenger station at Kenova, W. Va., for the Norfolk & Western and Huntington & Big Sandy roads. All work was stopped for six weeks owing to the failure of the timbers needed in the framing to arrive on time.

Mr. J. R. Booth, one of the wealthiest lumbermen in Canada, and President of the Canada Atlantic, and the Ottawa, Arnprior & Perry Sound roads, has offered to establish general car works at Ottawa, on condition of the city granting him a bonus. The only private car shops in Canada are those of the Crossen Company, of Cobourg, Ont., and the Rathbun Co., in Deseronto, Ont.

The Canadian Pacific has let a contract for building a new station at Regina, and has prepared plans for new stations at Brandon, Portage La Prairie, Man., and at Calgary in Alberta.

The Lake Street Elevated in Chicago.

One hundred thousand dollars having been secured for use on the Chicago Lake street elevated railroad, the work thereon has been resumed, and the officers of the company say they hope to have trains running to Garfield Park soon after the first of January, but the amount of money in sight is too small to permit so much work to be done in so short a time. Even the equipment could not be secured, to say nothing of the stations. About 1¼ miles of the structure, from Canal street to Ashland avenue, is constructed. The rails and ties for this section have been delivered and are nearly all laid. West of Ashland avenue the foundations are now being put in. It is reported that an 80-lb. rail will be used between Canal street and Ashland avenue, but it is probable that for the further sections of the road a 90-lb. rail will be used. As soon as the road is completed from Market street to Ashland avenue, this section of the road will be put into operation. It is said that the road will be extended toward the lake by a single track loop line running east in the alley between Lake and Randolph streets north in the alley between Wabash and Michigan avenues, and then west in the alley between Lake and South Water streets.

Chicago Main Drainage.

The Drainage Board has adopted the route of the Illinois & Michigan Canal between the South Branch and Summit, instead of the line advocated by Mr. Cooley, starting from the South Fork of the South Branch at Thirty-ninth street, which would have led the canal through the stock yards. Mr. Cooley contended that the primary object of the canal is the disposal of sewage, and that this can be best accomplished by commencing the canal where the most offensive sewage is produced. The majority of the Board, looking also at the creation of a harbor and waterway, and taking into account the right of way of the present canal and other asserted economics and advantages have located the canal as stated. It seems probable that the full-sized channel, with a capacity of 600,000 cubic feet, will be adopted be adopted between Summit and Willow Springs.

Tests of Staybolt Iron.

Recent tests of Tennessee staybolt iron made by R. W. Hunt & Co. gave the following results, which are much better than those obtained from the ordinary run of staybolt iron. If any of our readers know of iron that has given better results than those which follow, we would like to publish them:

Specimen cut from	⅞-in. round.
Original dimensions	⅞-in. round.
Dimensions after fracture	0.63-in.
Original area	0.601
Fractured area	0.311
Elastic limit, pounds, actual	20,200
Maximum load, pounds, actual	30 850
Elongation in 8 in	2.4 in.
Elastic limit per square inch	33,610
Maximum load per square inch	51,330
Per cent. elongated in 8 in	30
Per cent reduction of area	48
Character of fracture	Slightly laminated.

Locomotive Trials on the Pennsylvania.

The officials of the Pennsylvania Railroad Company are conducting important experiments on the New York Division and on the lines west of Pittsburgh which will lead to important changes in their passenger engines. These experiments began six months ago and are now approaching completion. Four engines, of different patterns, have been tried on the New York Division in competition with the class P and class K engines, which have proved the best engines for this work ever turned out of the Pennsylvania shops at Altoona. These four engines were built by the Baldwin and the Schenectady works, each firm building two. The English engine, No. 1320, which is fast and strong on level tracks, has also been in the competition, but its status has already been established, and it is not available as a 90-minute flyer with heavy trains to New York.

The engines and their principal dimensions are as follows:

No. 1504, Schnectady eight-wheel, weight 125,000 lbs.;

height of driving wheels, 78 in.; total weight of engine and tender, 102 tons; boiler pressure 180 lbs. per sq. in.

No. 1502, a Baldwin four-cylinder compound 10-wheel engine. Weight 132,000 lbs.; height of drivers, 72 in.; total weight of engine and tender 166 tons, boiler pressure, 180 lbs.

No. 1510, a Baldwin four-cylinder compound eight-wheel engine. Weight of engine, 124,000 lbs.; height of drivers, 78 in.; total weight of engine and tender, 102 tons.; boiler pressure, 180 lbs.

The fourth engine is a Schenectady two-cylinder compound 10-wheel locomotive. Height of drivers is six ft.; weight of engine, 135,000 lbs.; total weight of engine and tender, 109 tons. This is an unusually heavy engine.

The English engine is a three-cylinder compound, with 75-in. drivers and weighs, when ready for service, with the tender, 76 tons.

The engines have not been put to their vital test, as Theodore N. Ely, the General Superintendent of Motive Power, thinks that from six to nine months' use is required of a new engine before it is in a position to be tested at the very highest point of its capacity. The expected coming of Mr. Ely's own engine, 1,515, a two-cylinder compound with 7 ft. drivers, will add great interest to the experiments.

The experiments with the class X engines are also expected to determine hitherto unsolved questions. The company built 12 of these engines and put them in service between Pittsburgh and Chicago. They are 10-wheel machines, with six drivers 68 in. in diameter, weighing 135,000 lbs., and with the tender complete about 108 tons. —*Philadelphia Public Ledger.*

The West Superior Iron and Steel Company.

The plant of this company is about one and one-half miles west of the city of West Superior, on an inlet from the lake which is at present navigable for light vessels. The plant consists of two six-ton Bessemer converters and three cupolas in connection with them, complete plate and bar mills, and a large foundry and machine shop. The machinery for the steel making plant was made in Pittsburgh by well-known builders. The boilers at present in use are of the vertical tubular type, and are fitted with Brightman stokers. Some water tube boilers are now being erected. The works are turning out ship plates from ¼ to ⅝ in. thick, and have supplied the greater part of the plates used by the American Steel Barge Co. They are also rolling considerable quantities of angles and deck beams for the same company. The foundry department of the works is an important feature, and they are manufacturing large quantities of water and gas pipe, and cast pipe for culverts. The latter are made up to 60 in. in diameter and 6 ft. 4 in. long. The foundry is well equipped for both pipe casting and ordinary green sand casting, the molds for the former being arranged in circular pits. The company maintains a large machine shop, covering a floor space of about 100 × 100 ft., well provided with tools for general machine work, and makes considerable machinery for home use. At present a triple expansion blowing engine and a heavy sheers are under construction. The castings for all this work are made in the company's foundry, but large forgings are purchased. The company is not making any pig iron at present, but the Bessemer pig used by them is chiefly made near by in West Duluth. The iron ore from which this pig iron is made comes principally from the mines in the immediate neighborhood of Duluth and West Superior.

The Brooklyn Elevated Iron Work.

We have repeatedly referred to the bids received for extensions of the Brooklyn elevated railroad system. The following table summarizes the results:

Name of bidder.	Fulton avenue extension.		Fifth avenue extension.	
	Steel per pound.	Iron per pound.	Steel per pound.	Iron per pound.
	Cents.	Cents.	Cents.	Cents.
Cofrode & Saylor	3.05	3.05	3.05	3.15
Edge Moor Bridge Works	2.98	2.98	3.15	3.15
Carnegie Steel Co	No bid.	No bid.	†3.05	3.25
Union Bridge Co.	No bid.	No bid.	3.25	3.25
Pencoyd Iron Works	3.14	3.14	3.14	3.14
Cooper, Hewitt & Co.	*3.22	3.22	No bid.	No bid.
King Bridge Co	3.80	3.80	3.80	3.80
Phoenix Bridge Co.	No bid.	No bid.	3.15	No bid.

*Conditioned upon the terms of contract being made satisfactory.
†Conditioned on the time being extended 30 days.

The Edge Moor Bridge Works secured the Fulton avenue extension, calling for about 4,000 tons of material, while Cofrode & Saylor secured the 6,000 tons for the Fifth avenue extension.—*Iron Age.*

THE SCRAP HEAP.

Notes.

The sales of land by the Canadian Pacific road in October amounted to 32,095 acres, more than double the amount sold in September and three times as much as in October 1891.

An Omaha paper of Nov. 4 states that a jewelry salesman, travelling on a passenger train from Omaha to Missouri Valley, was robbed of $15,000 worth of diamonds by a man who attacked him with a pistol and a club, and who jumped from the train after committing the robbery.

At Duluth, Minn., last week a passenger train of the Eastern Minnesota road was seized by the sheriff to satisfy a judgment of $15,000 which a former employé had secured against the company. It took four hours to borrow and get together sufficient cars to run the train to St. Paul.

The conservative Philadelphia *Public Ledger*, is responsible for the statement that a passenger train on the Downingtown & Lancaster line of the Pennsylvania road recently killed 11 steers, and badly injured 10 others, at a single stroke. The train was traveling at high speed and ran into a drove of 40.

General Manager McDoel of the Monon is pleased with the result of the dining-car service for the first month. Before their introduction the road paid $10 a day for the Pullman buffet cars, and the Pullman Company took all the profits. The dining cars have averaged $48 (gross receipts) a day for the month.—*Western Paper.*

A St. Louis paper states that the telegraph operators of the St. Louis & Southwestern, whose representatives have been in consultation with the officers of the road for a month, have secured a considerable advance in wages. It is said that the minimum monthly salary will be $55. Train dispatchers will have their salaries raised from $110 to $120 a month.

World's Fair Notes.

The Chicago, Milwaukee & St. Paul proposes to build for the Post Office Department's exhibit at the World's Fair a model railroad post office car, one-sixth of the size of the regulation 60-ft. car, to be complete in every respect, including light, heat, cases and all other fixtures pertaining thereto.

Ore and Iron Notes.

The Lake Superior iron ore shipments for 1892 may break a record, according to the *Iron Trade Review*, which publishes the following table showing shipments for the past three years in gross tons:

	To Sept. 1.	To Oct. 1.	To Nov. 1.	For the Year.
1890	5,459,510	6,496,746	7,440,574	9,003,701
1891	3,954,510	5,005,860	6,017,789	7,011,933
1892	5,611,?27	6,836 995	7,823,251	.....

The volume of all rail shipments for this year, however, has been less than in either 1890 or 1891.

The first trainload—18 cars—of Mesaba ore was received at Duluth, Tuesday, the 1st inst. Some 6,000 or 8,000 tons will be shipped this fall to Pennsylvania and Ohio furnaces for trial during the winter.

It is said that the first of this month will show more furnaces in blast in the United States than on the first of October, which showed an increased capacity over the preceding month. Five furnaces in the Mahoning Valley have started up after several months shut down and two more are being put in readiness to start. All of these have had their capacity increased by 10 or 20 per cent. The rise in the price of steel billets from $21.50@$22 to $25, with a slight rise in Bessemer pig is accountable for the increased activity in the valley. Prices, however, are still very low. Bessemer pig is quoted $13.75 at Pittsburgh and $13.15@$13.25 at valley furnaces. Southern furnace men are asking $8.75@$9 for grey forge, and No. 1 anthracite is still $15@15.50. It is rather remarkable in this connection that Scotch G. M. B. warrants are holding steadily between 41s. and 41s. 6d. in spite of the depression in the English iron trade, while for May and June, 1888, they were 37s. 10½d., and No. 1 anthracite averaged $18.50 and $18 for those months.

The Thirsk Disaster.

The disaster to the Scotch express (Nov. 2) has revived, as nothing else could have done, the agitation in favor of abandoning the little boxes on wheels in which Englishmen allow themselves to be trundled about the country. The Pullman car near the head of the train not only preserved the lives of its occupants, but it saved all the cars behind it. The whole English press is emphatic in recognizing the superior strength and safety of American rolling stock, and in demanding a radical reform in car construction.—London Correspondent of the New York *Sun*.

It appears that the collision was caused by the forgetfulness of a block-signal operator. He had been up all night with a dying child and was physically worn out. He applied for leave of absence, but, according to the reports, was refused. His own version is: "The station master was willing to relieve me, but I was unable to get a substitute. I went on duty protesting that I was unfit to work, and soon fell asleep. I forgot the goods train, but directly I had signaled 'all clear' to the express I remembered that the goods train was on the same line. All I could do then was to wait for the crash."

New Pipe Line.

The contract to furnish the pipe for a new pipe line, to be built by the United States Refining Co., has been given to the Reading Iron Co. The first line will be built from the Warren and McKean oil territory to the lakes, and later a line to the seaboard. The new company will refine at points near the wells, and then pump the refined product to the shipping places.

Kanawha River Improvement.

The following are the bids received by the War Department for the iron work of locks and dams No. 7 and 8 of the great Kanawha River improvement in West Virginia: Werrier Machine Works Co., Lebanon, Pa., $7,811; H. T. Morrison & Co., Petersburgh, Va., $7,363; Thomas Carlins' Sons, Alleghany, Pa., $8,829; Lambert Bros. & Co., Ironton, O., $8,780. The contract was awarded to Morrison & Co., the lowest bidder.

A Bridge Accident.

Concerning the fall of a bridge on the Pacific extension of the Great Northern, on Oct. 24, we have the following official information. Other particulars may be found in the *Railroad Gazette* of Oct. 28. The temporary bridge at second crossing of Wenatchee River was constructed by putting in piling for the first deck, and the second deck consisted of timber bents set on top of the piling. The accident was caused by a sudden rise in the river, which undermined one bent of the piling. There was no settlement in the bridge to indicate that undermining had taken place. Traffic was delayed on account of the accident only two days. There will be no material delay to the completion of the Pacific extension on account of this accident.

The Kenova Bridge.

The paragragh describing the new Norfolk & Western bridge over the Ohio River in the description of the Ohio extension of that road, published Oct. 28, contained a typographical error, the length of the channel span being given as 502 ft. instead of 521 ft. the correct figure. Besides the channel span this bridge has four spans of 304 ft. each and a viaduct approach of 2,200 ft.

Fast Time on the Alton.

A press despatch of Nov. 7 reports that on that day a special train, drawn by engine No. 92, ran from Bloomington, Ill., to Chicago, 131 miles in 155 minutes; from Joliet to Coal City, 91 miles, the time was 100 minutes, which included two stops for orders and two for railroad crossings. From Pontiac to Odell, 12 miles, it is said that the rate of speed was 75 miles an hour.

British Columbia Coal.

The development of the coal industry in British Columbia in the past 30 years has been remarkable. The increase in the output of 1891 over 1890 is 340,957 tons more than the total output for any year up to 1886. The improved appliances, electrical and others, lately placed in the mines account for part of the increase in the output. The discovery of a fine coal field at Kamloops this year will favorably affect the trade. Taking the past three decades, it appears that the output of 1871 increased from 13,774 to 35,643 tons as compared with 1861. In 1881 the output ran up to 228,357 tons, increasing to 1,029,097 tons in 1891.

Grand Trunk.

The annual meeting of the Grand Trunk Railway Co., which was held in London, Oct. 31, appears to have been spirited, Sir Henry Tyler, the President, moved the adoption of the annual report, and in the course of a pretty long speech he said that, as a consequence of recent changes in the staff and administration of the road, he expects a saving of at least £40,000 annually. Mr. Girdlestone moved an amendment in favor of still more sweeping economies, particularly in the engineering and legal department. The amendment also opposed the construction of the new Toronto station, and the taking over of the Nipissing Line. Another stockholder who seconded the amendment urged the dismissal of Mr. Sargeant, the General Manager. Another stockholder said that the President and Directors should live in Canada, and attributed much of the success of the Canadian Pacific to the fact that its control is on the scene of operations. Sir Henry Tyler replied that the new Toronto station and the acquisition of the Nipissing Line are both essential to the development of the company's business, and will prove profitable investments. He said that it would be folly to transfer the control of the company to Canada for nearly all of its stockholders live in England, and they have a right to personal supervision of the administration of their investments. In reply to a question, he said that a pension of £1,000 had been given to Sir Joseph Hickson, the former General Manager. He said further that the Grand Trunk and the Canadian Pacific had made an agreement to dismiss any officer on either road detected in cutting rates. Mr. Girdlestone's amendment was rejected. An amendment postponing the proposed consolidation was carried.

The Elevation of Tracks at Elizabeth.

A hitch which may cause delay has occurred in the progress of the Pennsylvania elevation at Elizabeth, N. J. The City Council, contrary to the wishes of the property owners, granted the company's request to change Morris avenue so that it connects with the North Broad street crossing, saving the company the expense of building an arch across the avenue. The citizens have asked the County Board of Freeholders to interfere to save Morris avenue, which is a county road. Resolutions were adopted by the board requesting the railroad to comply with the demand of the property owners, stating that the avenue is a county road and must be kept open. The matter may be carried to the Supreme Court. Notwithstanding, work on the elevation is progressing rapidly and portions of the trestle are about ready to be erected.

LOCOMOTIVE BUILDING.

The Beech Creek Railroad is about to let contracts for ten locomotives.

The Great Northern has let 50 engines to the Brooks Locomotive Works.

The Canadian Pacific has had three new mogul locomotives built at its Montreal shops, and they will be used in the passenger service between Chapleau and Port Arthur.

The Pennsylvania gave an order last week to the company's shops at Altoona, Pa., for 20 class R engines. This makes 65 engines of this class ordered this month, 45 being under contract at the Baldwin Locomotive Works. It is said that the Altoona shops have orders for building over 60 engines.

CAR BUILDING.

The Central of Georgia, has ordered 700 cars to be delivered by Jan. 1 next.

The Pennsylvania is considering the building of 5,000 freight and passenger cars for which contracts will soon be awarded.

The Wagner Palace Car Co's. shops, at East Buffalo, are working full force on new cars and rebuilding old ones. All cars sent into the shops have wrought iron framing put in.

BRIDGE BUILDING.

Addison, W. Va.—The contract for a highway bridge over Elk River at the mouth of Bergoo Creek in Webster County, W. Va., has been let and work will begin next week.

Florence, Ala.—Neely, Smith & Co., of Florence, have received the contract for 12 stone piers for the new iron bridge to be built by the Memphis & Charleston at this point. Three piers have already been replaced since the bridge accident last summer. The material for the new bridge is being received and work will shortly begin. This bridge was described last week in these columns.

Lansing, Mich.—Proposals are wanted by the City Engineer until Nov. 21, for constructing the superstructure of a new bridge over Grand River, at Franklin street.

Nashville, Tenn.—The Board of Public Works last week opened bids for the construction of the Oak street bridge. The bids for the iron structure ranged from $5,100 to $5,800. The following were bidders: Massillon Bridge Co., Youngstown Bridge Co., F. J. P. Bracket Bridge Co., W. H. Converse Bridge Co., Pennsylvania Bridge Co., King's Bridge Co. For the stonework and

excavation there were seven bids. All were referred to the City Engineer for examination.

Philadelphia. — Director Windrim, of the Public Works Department has asked for an appropriation of $150,000 for building a new bridge at Schuylkill Falls. Respecting this it is stated that the present bridge is becoming less secure for travel each year, and this appropriation is wanted this year, so that the pier foundations for a new bridge can be put in and the old one strengthened. The new bridge is to be a double decker.

Sioux City, Ia.—The City Engineer's report to the Street Committee on the cost of a bridge across the Floyd at Chambers street stated that a bridge on the direct line of the street would require 375 ft. of pile bridge and 225 ft. of grading, at a total cost of $3 800. The report was approved and the Street Committee authorized to advertise for bids.

Somerset County, Md.—The County Commissioners have ordered the rebuilding of the long bridge connecting Deal's Island to the main land.

Tweed, Ont.—Tenders will be received at the County Clerk's office, Belleville, up to Nov. 28, for the erection of a steel truss bridge over the Moira River, at the village of Tweed, consisting of two spans of about 100 ft. each; roadway to be 16 ft. in the clear. Work is to be commenced by March 15, 1893.

Yankton, S. D.—The contract for building the railroad and wagon bridge over the Missouri River at this place has been let, and work is to be commenced before July 1, 1893.

RAILROAD LAW—NOTES OF DECISIONS.

Powers, Liabilities and Regulation of Railroads.

The Federal Court decides that under the general rule that the grant of a franchise of a public nature is personal to the grantee, and cannot be alienated without the consent of the government; the privilege granted to the Union Pacific Railway Company, by the acts of 1862 and 1864, of constructing and operating a telegraph line aloug its right of way, for public and private uses, carried with it a corresponding obligation on the part of the company to itself operate such line, and it had no authority to transfer the franchise to any other corporation.[1]

The Supreme Court of Illinois holds that a provision in the charter of a railroad company exempting it from taxation does not relieve its real property from liability for special taxes levied to pay for local improvements, since special taxes are based on the theory of compensation for the benefit received from the improvement.[2]

In Tennessee the Supreme Court rules that where a railroad performs its functions within the State of Tennessee as a domestic corporation by virtue of a charter granted by the legislature, the fact that the same incorporators obtained earlier charters from Alabama and Mississippi, and effected an organization and still do business in those states, does not render the corporation any less a resident of Tennessee.[3]

In the Federal Court a railroad empowered by its charter to erect and maintain a bridge across the Cumberland River, in Kentucky, "so as not unreasonably to obstruct navigation," while rebuilding a portion of the bridge which had been blown down, erected a temporary bridge, which interfered with navigation, but arranged with all the packet companies plying the river for the transfer of all freight without extra charge to shippers. The amount of traffic of the railroad largely exceeded that on the river, and public convenience was in fact subserved by the plan pursued by the railroad company. The Court decides that this was not an unreasonable obstruction of navigation, and a shipper who refused to send his grain by water under the arrangement was not entitled to recover the extra freight paid for transporting it by rail.[4]

In Florida it is held of the Supreme Court that those structures forming parts of railroad beds by which they span streams, chasms, ditches, etc., are "bridges," the willful and malicious burning of which is prohibited by the state statute.[5]

In Illinois, where a railroad company, after condemning land for a right of way, and constructing its road thereon, leases a parallel line for ten years, and ceases to use its own line, though with the intention of resuming such use at the expiration of said time, its taking up its track and allowing its right of way to be fenced in by the owner of the adjoining land, and held by him during said ten years, do not constitute an abandonment of its right of way.[6]

In Michigan where the petition of a railroad company to abandon a portion of its line is granted, the title to the land which was taken for right of way and for other railroad purposes reverts to the original owners, without a reconveyance or order of the court; and individuals who contributed to the construction of the line should be repaid, with interest.[7]

In Illinois under the statute of 1849 which authorizes cities to subscribe to the stock of railroad companies, and to issue their bonds therefor, a city might make such subscription, although its charter contained no provision on the subject.[8]

In the above case a county agreed, by popular vote, to subscribe for $100,000 of stock in a railway company, and to issue bonds therefor; but, before delivery of the bonds, the county authorities agreed to sell the stock back to the company in exchange for $30,000 in said bonds. This was done, and said $30,000 of bonds were returned to the county. The Supreme Court rules that the $70,000 of bonds delivered to the county were void, since the transaction, being in effect a gift instead of a subscription, was not authorized by the popular vote.[9]

None of the various statutes of the State of Oregon, either expressly or by implication, authorize a railroad corporation to lease its road and franchises, or to take similar leases from other railroad corporations; and such a lease is *ultra vires* and void.[10]

Carriage of Goods and Injuries to Property.

In Arkansas, a compress company, which was in the habit of receiving cotton at its sheds, had a contract with defendant railroad company to transport the cotton to its works across the river. On account of defendant's delay in furnishing transportation, cotton accumulated in the sheds and adjacent streets, and caught fire, the fire being communicated to plaintiff's warehouse. The Supreme Court holds that defendant was not liable for the destruction of plaintiff's warehouse by reason of negligence in keeping and storing cotton, where it appeared that defendant issued bills in exchange for receipts of the compress company, but never assumed control or possession of any cotton until it was placed on cars.[11]

In Indiana it is laid down by the Supreme Court that where the evidence shows that a fire originated on defendant's right of way, and was carried by the wind to plaintiff's property, though other lands intervened over which the fire burned several days, and was several times partially subdued before reaching his land, defendant is not relieved from liability on the ground that its negligence was not the proximate cause of the injury.[12]

In North Carolina the Supreme Court rules that where, in the construction of a railroad, a stream is turned from its natural course, and made to pass under the track in the channel of another stream, merely for the purpose of diminishing expense, the company will be liable in damages for overflow caused thereby above the point of original intersection of the streams, as well below as above the track, though the water way under the track furnished ample room for the passage of the water in the time of freshet.[13]

In Colorado under a statute which provides that "every railroad company operating its line of road, or any part thereof, within the state, shall be liable for all damages by fire that is set out or caused by operating any such line of road, or any parc thereof, and such damages may be recovered by the party damaged by the proper action in any court of competent jurisdiction," plaintiff is not required to prove negligence on the part of defendent in order to recover damages for burning his grass.[14]

In Montana, the grazing by plaintiff of his horses on the public domain was not of itself contributory negligence precluding him from recovering for their loss by reason of defendant's negligence.[15]

The Supreme Court of the United States lays it down that the terms "ordinary care," "reasonable prudence," and such like terms have a relative significance, and cannot be arbitrarily defined; and, when the facts are such that reasonable men differ as to whether there was negligence on the part of the plaintiff, the determination of the matter is for the jury; nor is it error to instruct them to fix the standard for reasonable, prudent, and cautious men according to their judgment and experience.[16]

In Nebraska, since by statute it is made the duty of every railroad company to properly construct and maintain in good repair crossings over all public highways on the line of its road, so that the same shall be safe and convenient for travelers, so far as it can do so without interfering with the safe operation of the railroad, a railroad company, if it negligently allows a greater space between the planking on a crossing and the rails than is neeessary for the running of its trains, is liable for injuries to a traveler's horse, whose foot is caught in such unnecessary space.[17]

In the federal courts there being no statute regulating the rate of speed at crossings, the common-law rule applies that the duty rests at all times upon the railroad company to use ordinary care in the management of its trains in approaching crossings, so that no unnecessary risk shall be cast upon those having the right to pass over said crossings, taking into consideration location and surroundings. The question of whether the railroad company should have flagmen or gates at crossings, in the absence of statutes, depends on the amount of travel over the crossing, the obstructions, etc., and is a matter of fact to be determined by the jury.[18]

In Texas the track at a crossing had been in bad condition, the train was running at a high rate of speed, and there was no whistle sounded or bell rung. Plaintiff testified that, when he reached the crossing, he looked and listened for trains, but heard and saw none; that he drove on the track, and the wheels of his wagon caught in the rail, and were held there; that he made ineffectual attempts to get his horses away from the track; and that he was almost immediately struck by the train. Those on the locomotive could have seen the horses between two and three hundred yards away, but plaintiff, from his position on the wagon, could not have seen the train. Several witnesses testified that plaintiff whipped up his horses to cross the track ahead of the locomotive. None of the trainmen were called to testify. The Supreme Court rules that a verdict for plaintiff would not be reversed.[19]

Injuries to Passengers, Employes and Strangers.

The Supreme Court of New York holds that a person arrested on a charge of disorderly conduct on the cars of an elevated railroad and convicted thereof, cannot maintain an action against the company for false imprisonment, the arrest having been made by a police officer, and the imprisonment directed by the public authorities.[20]

In Georgia it appeared that plantiff, who was a waiter in a hotel, as was his custom and duty, took dinner to conductor on defendant's train, and in getting off the train while it was in motion was injured. There was evidence that the conductor told plaintiff to jump from the train, and on his objecting because train was going too fast, said that if he did not jump he (the conductor) would kick him off.[21]

In Tennessee the Supreme Court rules that when a man who was not an employé was riding on a timber train on which no persons were allowed to be carried except the trainmen, and he was not there by invitation of any one who had authority to invite him, and had not paid any fare, and was injured in a collision between such train and another train of defendant, he was not entitled to recover, if the negligence of defendant's trainmen causing the accident was not wanton or willful.[22]

In Pennsylvania it is ruled by the Supreme Court that where a passenger waiting for a train at a station, the platform of which is properly constructed, stands so near the track as to be struck and killed by the bumper of a passing locomotive, the railroad company is not liable.[23]

In California the Supreme Court holds that in an action for injuries causing the death of a brakeman while attempting to couple cars, the fact that the character of coupling used by defendant was in general use among railroad companies only tends to show ordinary care in its selection, and is not conclusive evidence that defendant was not negligent.[24]

In Missouri the Supreme Court rules that where a switchman wes thrown by the sudden moving of the train, while uncoupling cars, and his arm was caught and crushed between the guard-rail and the main rail, the failure of defendant to block the guard rail should not be submitted to the jury as a ground for recovery, since blocking is only intended to prevent feet from being caught.[25]

In New York it appeared that a flagman was killed by an engine running without a headlight; that the headlight, before the engine left the roundhouse, was inspected by defendant's inspector, and found in good condition; that, when the engineer found it out of order he was at a station where defendant had repair shops, with facilities for repairing it; and that it was the engineer's duty to have it repaired before proceeding with the engine. The Supreme Court rules that the negligence of the engineer in failing to have the headlight repaired, and in running the engine without a headlight was the negligence of a fellow servant, for which defendant was not liable.[26]

In Wisconsin, the deceased had been employed as fireman on a switch engine, in the yard of defendant, for about one year previous to the time of the accident; on the day of the accident, after he had left the engine and started to cross the tracks of defendant, he was struck by another switch engine used in defendant's yard and killed. Plaintiff based his right to recover under a statute which provides that, while locomotives are being propelled in a city or village, no "train or locomotive shall go faster, until after having passed all the traveled streets thereof, than at the rate of six miles per hour," and that the accident was caused by the negligence of defendant in allowing the engineer of the switch engine to run at an illegal rate of speed, and in failing to give signals. The Supreme Court decides that it was competent to show that it was the custom to run its switch engines faster than the statute allowed, and that the decedent knew it, not as a defense, but as bearing on the extent of the risk which decedent voluntarily assumed by remaining in its employ with knowledge of the fact that switch engines were run at an illegal rate of speed.[27]

[1] United States v. Western Union Tel. Co., 50 Fed. Rep., 28.
[2] Ill. Cent. R. Co. v. Mattoon, 30 N. E. Rep., 173.
[3] M. & O. R. Co. v. Barnhill, 19 S. W. Rep., 21.
[4] Rhea v. N. N. & M. V. R. Co., 50 Fed. Rep., 16.
[5] Duncan v. State, 10 South. Rep., 815.
[6] Durfee v. P., D. & E. R. Co., 30 N. E. Rep., 686.
[7] In re Flint & P. M. R. Co., 50 N. W. Rep., 1,091.
[8] Samson v. People, 30 N. E. Rep., 781.
[9] Samson v. People, 30 N. E. Rep., 699.
[10] Oreg. R. & Nav. Co. v. Oreg. R. Co., 12 S. C. Rep., 814.
[11] Martin v. St. Louis, I. M. & S. Ry. Co., 19 S. W. Rep., 314.
[12] C., St. L. & P. R. Co. v. Williams, 30 N. E. Rep., 696.
[13] Adams v. Durham & N. R. Co., 14 S. E. Rep., 857.
[14] Denver, T. & G. R. Co. v. De Graff, 29 Pac. Rep., 684.
[15] McMaster v. M. U. Ry. Co., 29 Pac. Rep., 539.
[16] Grand Trunk R. Co. v. Ives, 12 S. C. Rep., 679.
[17] B. & M. R. R. Co. v. Koonce, 51 N. W. Rep., 1,033.
[18] Lapsley v. U. Pac. R. Co., 50 Fed. Rep., 172.
[19] G., H. & S. A. Ry. Co. v. Matula, 19 S. W. Rep., 376.
[20] Oppenheimer v. Manhattan Ry. Co., 18 N. Y. S., 411.
[21] S., F. & W. R. Co. v. Watson, 14 S. E. Rep., 800.
[22] Ill. Cent. R. Co. v. Meschans, 18 S. W. Rep., 292.
[23] Matthews v. Penn. R. Co., 24 At. Rep., 67.
[24] Martin v. Cal. Cent. Ry. Co., 29 Pac. Rep., 645.
[25] Rutledge v. Missouri Pac. Ry. Co., 19 S. W. Rep., 38.
[26] McDonald v. N. Y. & H. R. R. Co., 18 N. Y. S., 609.
[27] Abbot v. McCadden, 51 N. W. Rep., 1,079.

MEETINGS AND ANNOUNCEMENTS.

Dividends.

Dividends on the capital stocks of railroad companies have been declared as follows:

Catawissa, semi-annual, 3½ per cent., on the preferred stock, payable Nov. 18.

Chicago & Alton, quarterly, 2 per cent., on the preferred and common stock, payable Dec. 1.

Old Colony, quarterly, 1¾ per cent., payable Dec. 1.

Stockholders' Meetings.

Meetings of the stockholders of railroad companies will be held as follows:

Baltimore & Ohio, annual, Baltimore, Md., Nov. 21.

Buffalo, Rochester & Pittsburgh, annual, New York City, Nov. 21.

Chicago, Indianapolis & Chattanooga, annual, Indianapolis, Ind., Nov. 15.

East Tennessee, Virginia & Georgia, annual, Knoxville, Tenn., Nov. 16.

New York, Lake Erie & Western, annual, New York City, Nov. 29.

New York & New England, special, Boston, Mass., Nov. 21, to approve the lease of the Providence & Springfield.

Philadelphia, Newtown & New York, special, Norristown, Pa., Nov. 28, to consider an increase of bonds to $1,600,000.

Toledo, St. Louis & Kansas City, special, Toledo, O., Nov. 14, to consider an increase of bonds to $13,500,000.

Technical Meetings.

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Roadmasters' Association of America* will hold its next annual meeting at Lookout Mountain Hotel, Chattanooga, Tenn., beginning Nov. 15, having been postponed from Oct. 18.

The *New England Railroad Club* holds regular meetings, at the United States Hotel, Beach street, Boston, Mass., on the second Monday of each alternate month, commencing January.

The *Western Railway Club* holds regular meetings on the third Tuesday in each month, except June, July and August, at the rooms of the Central Traffic Association in the Rookery Building, Chicago, at 2 p. m.

The *New York Railroad Club* holds regular meetings on the third Thursday in each month, at 7:30 p. m., at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, N. Y.

The *Central Railway Club* meets at the Hotel Iroquois, Buffalo, the fourth Wednesday of January, March, May, September and November.

The *Northwest Railroad Club* meets on the first Saturday of each month, except June, July and August, in the St. Paul Union Station, at 7:30 p. m.

The *Northwestern Track and Bridge Association* meets on the Friday following the second Wednesday of March, June, September and December, at 2:30 p. m. in the directors' room of the St. Paul Union Station.

The *American Society of Civil Engineers* holds its regular meetings on the first and third Wednesday in each month, at the House of the Society, 127 East Twenty-third street, New York.

The *Boston Society of Civil Engineers* holds its regular meetings at Wesleyan Hall, Bromfield street, Boston, at 7:30 p. m., on the third Wednesday in each month.

The *Western Society of Engineers* holds its regular meetings at 78 La Salle street, Chicago, at 8 p. m., on the first Wednesday in each month.

The *Engineers' Club of St. Louis* holds regular meetings in the club's room, Laclede Building, corner Fourth and Olive streets, St. Louis, on the first and third Wednesday in each month.

The *Engineers' Club of Philadelphia* holds regular meetings at the House of the Club, 1,122 Girard street, Philadelphia, on the first and third Saturday of each month. The annual meeting is held on the third Saturday in January.

The *Engineers' Society of Western Pennsylvania* holds regular meetings on the third Tuesday in each month, at 7:30 p. m., at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa.

The *Engineers' Club of Cincinnati* holds its regular

meetings at 8 p. m. on the third Thursday of each month in the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati.

The *Civil Engineers' Club of Cleveland* holds regular meetings on the second Tuesday of each month, at 8 p. m., in the Case Library Building, Cleveland. Semi-monthly meetings are held on the fourth Tuesday of the month.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* holds its monthly meetings on the second Thursday at 8 p. m. The Association headquarters are at Nos. 63 and 64 Baxter Court, Nashville, Tenn.

The *Denver Society of Civil Engineers and Architects* holds regular meetings at 36 Jacobson Block, Denver, Col., on the second and fourth Tuesday of each month, at 8 o'clock p. m., except during June, July and August, when they are held on the second Tuesday only.

The *Civil Engineers' Society of St. Paul* meets at St. Paul. Minn., on the first Monday in each month.

The *Montana Society of Civil Engineers* meets at Helena, Mont., at 7:30 p. m., on the third Saturday in each month.

The *Civil Engineers' Association of Kansas* holds regular meetings at Wichita on the second Wednesday of each month at 7:30 p. m.

The *American Society of Swedish Engineers* holds meetings at the club house, 250 Union street, Brooklyn, N. Y., and at 347 North Ninth street, Philadelphia, on the first Saturday of each month.

The *Engineers' Club of Minneapolis* meets the first Thursday of each month in the Public Library Building, Minneapolis, Minn.

The *Canadian Society of Civil Engineers* holds regular meetings at its rooms, 112 Mansfield street, Montreal, P. Que., every alternate Thursday except during the months of June, July, August and September.

The *Association of Civil Engineers of Dallas* meets at 803 Commerce street, Dallas, Tex., on the first Friday of each month at 4 o'clock p. m.

The *Technical Society of the Pacific Coast* holds regular meetings at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., at 8 o clock p. m. on the first Friday of each month.

The *Tacoma Society of Civil Engineers and Architects* holds regular meetings on the third Friday of each month, in its rooms, 201 and 202 Washington Building, Tacoma, Wash.

The *Association of Engineers of Virginia* holds regular meetings at Roanoke, on the second Saturday in each month, at 8 p. m., except the months of July and August.

The *Engineers' and Architects' Club of Louisville* holds regular meetings on the second Thursday of each month, at 8 o'clock p. m., at its rooms in the Norton Building, Louisville, Ky.

Canadian Society of Civil Engineers.

A meeting has been called for Nov. 11, at the society's rooms, at 112 Mansfield street, Toronto. At this meeting the discussion on "Transition Curves," by Mr. H. R. Lordly, will be resumed. A paper on "The Simplification of the Quadruplex" will be read by the author, Mr. D. H. Keeley, A.M., Can. Soc. C. E.

Engineers' Club of St. Louis.

The club met at 8 P. M., Nov. 2, 1892, President Johnson in the chair, and 32 members and eight visitors present.

The paper of the evening was read by Mr. B. H. Colby, on "The Recent Survey of St. Louis; its Methods and Results." Mr. Colby gave the geodetic basis on which the work was founded, and the means adopted for securing monuments and bench marks. He then specified the instruments used; a Gambe, a Fauth and two Buff & Berger transits, all reading to 10 seconds. The area already triangulated, exceeding 27,000 acres, was described, and the number of stations occupied, which averaged two stations to the square mile. The base line used has a length of almost six miles. The error of closure in the triangles averaged 3.7 seconds and the mean error per angle was 1.2 seconds. The general system of triangulation was to carry a series of primary triangles from the base line to the extreme limits of the city, with an average length of sides of about two miles, and then fill in the intermediate ground with small secondary triangles. Pole targets which were difficult to see on account of the smoke, and were tampered with by mischievous boys, were replaced by heliotropes or flash signals. The flash system gave much better closures of the triangles, as the average was 4.6 seconds with the poles, and 2.7 seconds with flash signals, or an average of both systems of 3.7. The heliotropes also permitted the Morse alphabet to be used in telegraphing from station to station. The method of carrying on precise leveling was then described. 743 benches have been established, or 12 per square mile, mostly on the stone-sills of the buildings. The average error has been $\frac{1}{1000}$ ft. per mile, and the maximum permitted was $\frac{1}{1000}$ ft per mile. Mr. Colby gave the results of some stadia observations made after 4 P. M., which showed that the refraction error is so great as to make stadia more unreliable before 10 A. M. or after 4 P. M.; an error of 0.2 ft. was found in 200 metres. Mr. Colby also gave the results of carrying a stadia survey around the perimeter of St. Louis that covered a distance of 40.4 miles, and 306 stations were occupied, with an average length of 211 metres per station. The maximum error in azimuth was 12 ft. 35 in. at a distance of 34.9 miles, and the closing error was 8 ft. 20 in. The error in altitude in closing, after running the 40.4 miles, without checking on any intermediate benches, was $\frac{14}{100}$ foot, with a maximum of 1.37 ft. at the twenty-seventh mile. The cost of the triangulation, topography, leveling and office work, covering all expenses for 815 working days, amounted to about $35,000, at a cost of $1.15 per acre, or 14.5c. per lot. The work was carried on by four engineers, with assistants, but only one party was in the field at a time, the others being busy in the office.

The Southern and Southwestern Railway Club.

The next meeting of the Southern and Southwestern Railway Club will take place at the Kimball House, Atlanta, Ga., on Thursday, Nov. 17, 1892, at 10 a. m. The annual election of officers will take place.

The subjects for discussion will be:

(1) "The best course to pursue to reduce oil consumption in engines and cars." (2) "Driving boxes—best material and shape, in order to prevent breakage and wear. Is the solid box suitable for heavy engines?" (3) "Staybolt inspection."

The following committee is expected to make a report: W. H. Thomas and Pulaski Leeds—on "Repair Work on Large Systems and Location of Plants for Same." S. A. Charpiot, Macon, Ga., is Secretary.

Western Society of Engineers.

This society held its regular November meeting in the rooms of the Central Traffic Association in The Rookery on November 2.

SMOKE PREVENTION.

Mr. Chas. F. White, Consulting Engineer of the Society for the Prevention of Smoke, gave an interesting talk on the work which the society has been and is doing, and briefly described the general character and principles of construction of smoke preventing furnaces which are in common use. Mr. White stated that the efforts of the society had been almost entirely confined to the central business district of Chicago and that very little had been done outside of this small district. The smoke nuisance from tugs on the river had been almost wholly abated by the adoption of anthracite coal as fuel after trials with various cokes had proved them to be unsatisfactory. The tug owners have agreed to use anthracite coal until Jan. 1, after that some new arrangements will have to be made. In regard to locomotives Mr. White said that almost all locomotives which run into the city were now fitted with smoke preventing devices and that all of them were to a great extent satisfactory when the engine was working, the principal difficulty being when the engine was standing at stations. The device which has proved most satisfactory for locomotives was the Barnes device, used on the Wabash Railroad, which includes steam jets in the furnace, a long brick arch and a steam jet in the smokebox. With such an arrangement as this, properly porportioned, it was possible to avoid dense smoke under all circumstances, but that if it was not carefully proportioned or if any of the three features were omitted it would not prevent visible smoke at times. Mr. White laid considerable stress on the necessity of a long brick arch. For stationary boilers any of the various devices such as steam jets, cooking furnaces and down draft furnaces gave satisfactory results if they were carefully handled and unless the boilers were overworked. The principal difficulty he thought was due to the negligence of firemen in not using the smoke preventing appliances with which boilers in the business district of Chicago were fitted almost without exception. Another difficulty which has been encountered in the business blocks came from the fact that as it is now considered necessary to have the first floor on a level with the sidewalk and to place the boilers and machinery in the basement below this floor. The vertical space available is limited by the position of the sewers to about 10½ ft. and everything has to be put into this space. This makes it especially difficult to fit some furnaces with smoke preventing features for which considerable head-room is necessary It is not possible with any devices to wholly prevent smoke when fires are being started in the morning, or are being worked up from banked fires, or when cleaning fires. The result of this is that it will never be possible to do away with smoke during the early hours of the morning when fires are generally started, but that during the day it is perfectly practicable to reduce the volume of smoke hanging over the city to very small proportions.

During the discussion which followed Mr. White's paper, the well known facts that the prevention of smoke ordinarily costs money, although the additional cost is not likely to be a hardship in any case, and that with bituminous coal the absence of smoke is by no means an evidence of complete combustion were brought on.

PERSONAL.

—Mr. S. A. Ford, for the past 14 years chief chemist of the Edgar Thomson Steel Works at Braddock, has resigned. Ill-health is given as the cause for his resignation.

—Mr. George W. Keeler, General Eastern Agent of the Mexican Central, died Nov. 5, from Bright's disease, at his home in Brooklyn, N. Y. Mr. Keeler had been connected with the Mexican Central for a number of years and was 47 years old.

—Mr. H. B. Hodges has been appointed Superintendent of Tests in the department of the General Superintendent of Motive Power of the Baltimore & Ohio, vice Mr. L. S. Randolph, appointed Electrical Engineer of the Baltimore Electric Refining Co.

—Mr. Oscar G. Murray, Traffic Manager of the Cleveland, Cincinnati, Chicago & St. Louis, and the Chesapeake & Ohio was last week elected Second Vice President of the former company. Mr. Murray was formerly General Freight Agent of the Missouri Pacific and has been Traffic Manager of the "Big Four" system for several years.

—Mr. Andrew W. Quackenbush who has been Superintendent of Machinery of the Chicago & Alton road for about four years, resigned last week. His successor is Mr. Jacob Johann, who has lately been agent of the Pintsch car lighting system in Chicago, but was formerly Superintendent of Motive Power on the Texas & Pacific.

—Mr. Richard Connolly, a passenger conductor on the Western New York and Pennsylvania, has received a testimonial from the directors of the road, in recognition of his courage and good judgment in taking his train to a place of safety at the time of the great fire in Oil City several months ago. It is stated that the other men on the train abandoned their posts without due regard to the safety of the passengers.

—Mr. August Mordecai has been appointed Civil Engineer of the New York, Lake Erie & Western, to succeed Mr. C. W. Buchholz, resigned to become President of the Quaker City elevated road, of Philadelphia. Mr. Mordecai entered the service of the New York, Pennsylvania & Ohio in 1873 as Assistant Engineer. In 1889 he was promoted to be General Roadmaster of the N. Y., P. & O. and Chicago & Atlantic, now Chicago & Erie, and he has since held that position. On Oct. 27, before departing from the West, the officials of the N. Y., P. & O., and the Chicago & Erie tendered Mr. Mordecai a dinner at the Grand Pacific Hotel, Chicago, at which officials of both roads made complimentary speeches, wished him great success in his new office, and presented him with a diamond stud and ring.

—Mr. David Mackenzie, who has been Purchasing Agent of the Central Vermont since last March, has been appointed Superintendent of the New London Division of the road, and has been succeeded as Purchasing Agent by Mr. William B. Hatch, Fuel Agent for the last year. Mr. Mackenzie's first railroad service was on the Vermont Central in 1865 as a brakeman, and he was afterwards General Baggage Agent, and Assistant General Passenger Agent in 1882. He was then appointed Assistant Superintendent of the Mexican Central and General Superintendent in 1888. Afterward he was Vice-President and General Manager of the "Pacific Short Line" for several years until he again became connected with the Central Vermont this year.

ELECTIONS AND APPOINTMENTS.

Atlanta & West Point.—Captain John A. Gee has been made General Passenger Agent of the road. Captain Gee has been with the company for the past five years. He has filled several positions in the passenger department of that road, and lately has been Assistant General Passenger Agent.

Boston & Albany.—T. B. Purves, Jr., has been appointed Master Mechanic of the shops at East Albany, N. Y., to succeed his father, who has held the position about 40 years. Mr. Purvis, Sr., will act as assistant to his son.

Brooklyn Elevated.—The following recent changes have been made in the operating department of the road: E. M. Hedley appointed Master Mechanic, vice O. Fairhurst, resigned; Francis D. Fisher appointed Superintendent, and A. A. Stuart has been made Engineer of Maintenance and Construction. The headquarters of all will be in Brooklyn, N. Y.

Canada, La Crosse & Southwestern.—The stockholders held their annual meeting in La Crosse, Wis., Nov. 1, and elected the following officers: President, F. A. Rosiene, of Charles City, Ia.; Vice-President, Alex. McMillan, La Crosse; Secretary, R. Calvert, La Crosse; Treasurer, S. S. Burton, La Crosse.

Central Vermont.—D. Mackenzie has been appointed Superintendent of the New London Northern Division of this company, with office at New London, Conn., in place of C. F. Spalding, resigned. W. B. Hatch has been appointed General Purchasing Agent of this company, with office at St. Albans, Vt., in place of D. Mackenzie, transferred.

Charleston, Clendennin & Sutton.—The officers of this company are: Charles C. Lewis, President; J. D. Baines, Secretary and Treasurer, and Chas. K. McDermott, Chief Engineer, all of Charleston, W. Va.

Chattahoochee Valley.—W. C. Lanier, of West Point, Ga., H. Lanier, of Atlanta, Ga., and others have applied for a charter for this road, in Georgia. It is to extend from West Point, Ga., to Enfaula, Ala., and the capital stock is $200,000.

Chesapeake & Ohio.—O. G. Murray having, on account of promotion and increased duties on the Cleveland, Cincinnati, Chicago & St. Louis, found it necessary to resign the position of Traffic Manager of this company, the office has been abolished, and the several heads of departments will report direct to the President, M. E. Ingalls.

Cincinnati, Lebanon & Northern.—H. E. Sawyer has been appointed Master of Transportation with office at Cincinnati. The office of General Superintendent has been abolished.

Clear Lake & Russian River.—The incorporators are F. W. Gibson, A. H. Spurr, R. W. Crump, E. W. White, M. Justus, A. Levy, C. E. Phelan, M. S. Sayre. W. J. Biggerstaff, William Gessner, H. B. Wells, L. Sailor and W. D. Rance, of Lakeport, Cal.

Cleveland, Cincinnati, Chicago & St. Louis.—Oscar G. Murray, having been elected Second Vice-President, the office of Traffic Manager has been abolished. All traffic and transportation matters will be in charge of the Second Vice-President, who will report to the President.

Columbus Southern.—Major George A. Whitehead, for many years General Freight Agent of the Central of Georgia, is now Traffic Manager of this road, with headquarters in Columbus, Ga.

Interoceanic (Mexico).—H. A. Vaughan, until recently division superintendent of the Mexican Central, has been appointed Superintendent of the Puebla division of this road, with headquarters at Puebla, Mex.

Jacksonville, St. Augustine & Indian River.—C. C. Deming having resigned the offices of Vice-President and Secretary of these companies, J. R. Parrott has been appointed Vice-President, with headquarters at St. Augustine, Fla., and continues as General Counsel, with office at Jacksonville. J. C. Salter has been appointed Secretary, with headquarters at No. 36 Broadway, New York City.

Lehigh & Hudson River.—J. H. Olhausen has been appointed General Superintendent of this company, with office at Jersey City, N. J. P. H. Wyckoff has been appointed General Traffic Manager of this company, with office at 143 Liberty street, New York City. These officers hold the same positions on the Central of New Jersey.

Manhattan.—The directors elected at the annual meeting on Nov. 9 were Jay Gould, George J. Gould, Russell Sage, Samuel Sloan, R. M. Gallaway, J. Pierpont Morgan, Edwin Gould, Frank K. Hain, Simon Wormser, T. C. Eastman, G. P. Morosini in place of Cyrus W. Field, Donald Mackay, of Vermilye & Co., in place of Sidney Dillon, and George Bliss, of Morton, Bliss & Co., in place of Chester W. Chapin.

Mexican Freight Association.—F. W. Dill has been appointed to assist Mr. How, the Chairman of the Mexican Freight Association, as Chief Clerk. Mr. Dill was formerly Assistant General Freight Agent of the Mexican Central.

Michigan Central.—F. O. Waldo has been appointed Assistant Auditor of this company; W. F. Parsons has been appointed Ticket Accountant of this company, vice F. O. Waldo, promoted; both with headquarters at Detroit.

Monterey & Mexican Gulf.—In the Federal Court at Monterey, Mex., Judge Rael has appointed J. A. Robertson, Receiver, with full power to control and operate its lines. General Manager Robertson has appointed John Grace General Superintendent, with jurisdiction over the maintenance of way, operating and mechanical departments, with headquarters at Monterey, Mex., vice C. A. Merriam, resigned.

New Orleans & Northeastern.—The company held its annual stockholders' meeting at New Orleans, Nov. 3. The following were elected Directors: Henry Abraham, Jules Aldige, New Orleans; Frank S. Bond, D. Graff, New York; Harry H. Hall, James S. Ricardson, New Orleans; C. C. Harvey, Charles Schiff, Cincinnati; R. M. Walmsley, New Orleans. The Directors elected Charles Schiff, President; C. C. Harvey, Vice President; John Glynn, Jr., Secretary; H. H. Tatem, Treasurer.

New York, Chicago & St. Louis.—George James has been appointed Master Mechanic of the Western Division, vice T. B. Hinde, resigned, with headquarters at Stony Island, Judd P. O., O.

New York, Lake Erie & Western.—H. C. Barlow has been promoted to be division Freight Agent, Western and Bradford divisions, with office at Bradford, Pa.

New York & Northern.—The annual meeting in New York, Nov. 9, resulted in the re-election of the old board of directors as follows: C. T. Barney, J. J. Borden, A. M. Billings, George Coppell, Thomas Denny, H. F. Dimock, R. M. Gallaway, G. G. Haven, R. S. Hayes, William Mertens, Oliver H. Payne, George W. Smith and William C. Whitney. The board re-elected R. S. Hayes, President; H. F. Dimock, Vice-President; G. G. Haven, Jr. Secretary and Treasurer, and H. H. Vreeland, General Superintendent.

North Pennsylvania.—Thomas McKean has been elected President of the company, in place of the late Edward C. Knight.

Olean, Oswayo & Eastern.—The following are the directors of this new Pennsylvania road; J. B. Rumsey, Columbus, O., President, and W. Cobb, Jr., and Theodore Cobb, Spring Mills, N. Y.; C. H. Rathbone, Bradford, Pa.; J. Walter Wells, A. B. Payne and W. W. Crittenden, Oswayo, Pa.

Paducah, Tennessee & Alabama.—F. L. Drake has resigned as Assistant General Passenger Agent of the Illinois Central & Yazoo & Mississippi Valley Road at Memphis, and assumed the duties of General Freight and Passegger Agent of the Paducah, Tennessee & Alabama and the Tennessee Midland roads.

Philadelphia, Germantown & Norristown.—The stockholders of the company last week re-elected for three years the following managers, whose terms had expired: Thomas U. Walker, Michael O'Brien, John Slingluff, Edward D. Toland.

Philadelphia & Reading.—John T. Dennithorn, of Phœnixville, Pa., who was appointed Engineer of the New England Division, has been transferred to the Reading & Columbia and Pinegrove divisions. Chas. A. Ewing has been appointed Division Engineer of the New England Division, with headquarters at Hartford, Conn.

Pullman's Palace Car Co.—J. C. Gibbons, District Superintendent Central of New Jersey division, at Jersey City, has been promoted to be District Superintendent Pennsylvania Railroad, at Jersey City, to succeed J. H. Sims, resigned. H. Pollock, in the company's service at Chicago, has been appointed District Superintendent of the Pennsylvania Division, at Jersey City, vice Frederick E. Williams, promoted to be District Superintendent at Cleveland.

St. Louis, Chicago & St. Paul.—B. L. Babb has been appointed Auditor with headquarters at St. Louis. F. A. Reed has been made General Superintendent of the company, with headquarters at Alton, Ill.

Tennessee Midland.—P. L. Jones has resigned as Treasurer of the road, and will probably be succeeded by James W. Harrison, at present Treasurer of the Paducah, Tennessee & Alabama, with headquarters at St. Louis.

RAILROAD CONSTRUCTION.

Incorporations, Surveys, Etc.

Arkansas Mineral Belt.—The survey is now being made for this road north of Little Rock to the State line in Baxter County and to West Plains in Howell County, Mo., a distance of 175 miles. The officers are now endeavoring to get the right of way, and they state that if this can be secured with a subsidy of 500 acres of land for each mile of road, they are prepared to build the line immediately. W. L. Thompson, of Heber, Ark., is Secretary and Treasurer.

Brooklyn Elevated.—The Wilson & Bailey Mfg. Co., of South Brooklyn, N. Y., has been awarded the contract for building all the foundation work for the extension of the two lines of elevated structure in Brooklyn, N. Y., referred to in our issue of Oct. 21. The bids for the iron work on these extensions are given in another column.

Canadian Roads.—Application is to be made to the Dominion Parliament for a charter to build a road from Pembroke southeast to Haliburton, Ont., a distance of 80 miles, there to connect with the Haliburton branch of the Grand Trunk.

Charleston, Clendennin & Sutton.—The following description of this road has been received: The route follows along the south side of the Elk River from Charleston, W. Va., the southern terminus, north through Clendennin and Clay Court House to Sutton, W. Va., where it connects with the West Virginia & Pittsburgh. The entire line when completed will be 100 miles in length. Owing to the rich coal mines and extensive timber tracts of the region traversed, many new stations and works, in addition to those mentioned, will be built along the line. The surveys are well advanced and the first division of 20 miles of the road, with sidings, is now under contract. The grading, masonry, etc., on 16 miles of this is completed and the track laid on 12½ miles, ready for trains. The entire division of 20 miles will be ready for trains by Jan. 1. The cost of construction is very moderate, as the work is not difficult. The grades are exceedingly light, the maximum, used only in short stretches, will not exceed 26 ft. a mile, and the maximum curve will not exceed 8 degrees. It is the intention of the company to push the extension beyond the present division now under contract during the coming year. The headquarters are at Charlestown, W. Va.

Chattahoochee Valley.—A petition for incorporation has been filed in Georgia by W. C. Lanier, P. Lanier, R. Lanier and R. A. S. Freeman, of West Point, Ga.; E. F. Lanier, of Americus, Ga.; H. Lanier, of Atlanta, Ga., and L. Lanier, of Chambers County, Ala.

Cherry Run & Potomac Valley.—The Baltimore & Ohio engineering corps which has been at work laying out the new Potomac Valley line was taken off last week upon reaching the line between Jefferson and Berkeley Counties, W. Va. This was the second survey for the line which is proposed to shorten the distance between Cherry Run, W. Va., and Harper's Ferry.

Chesapeake & Ohio.—The company has awarded the contract to G. G. Gooch, of Staunton, Va., for building a second track between Backbone and Moore's Tunnel. The work includes heavy excavations and grading.

Choctaw Coal & Railway Co.—Several of the directors state that the plans for the reorganization of the company will soon be carried out and the property taken out of the hands of the receivers. Arrangements are being made for completing the line between South McAlester and El Reno, Ind. Ter., and it is expected that work will be begun on the construction of this division as soon as the stockholders assume control of the road. A number of directors and stockholders made a trip over the operated portion last week. The party included J. B. Bradford, Manager of the company's properties, F. I. Gowen, R. H. Sayre, E. P. Wilbur, E. B. Morris, C. E. Morgan, Thomas Dickson, W. A. Lathrop and W. A. Wilbur.

Clearfield & Mahoning.—The present status of the construction on this extension of the Buffalo, Rochester & Pittsburgh is as follows: The grading is practically finished from the connection with the main line at Du Bois, Pa., east to the junction with the Beach Creek at Jefferson Line, Pa., 27 miles, and this work will be entirely finished within 30 days. No track has yet been laid, but this will be begun by Dec. 1. The masonry is almost completed and the iron bridges are well under way in the shops.

Clear Lake & Russian River.—This company has been organized at Lakeport, Cal., and it is proposed to build a road from Clear Lake, near the city of Lakeport, to a point on the San Francisco & North Pacific, a distance of about 20 miles.

Crystal River.—The contractors have 400 men at work on the division of this road now being built. The grading and bridge work on the main line and on the branch from Coal Junction to Coal Basin, Col., 12 miles, is now going on, but no track has yet been laid. Orman & Crook, of Pueblo, Col., are the contractors for the grading and masonry, and Seeley & Jones, of Denver, are the contractors for ties. The maximum grades on the main line are 105.6 ft. to the mile; on the Coal Basin line 4 per cent., and on the branch from Marble Junction to Marble Basin, 3 miles, the grades are 3 per cent. The main line is to extend from Carbondale to Crystal, Col., 35 miles. The road is being built by the Colorado Coal & Iron Co. to reach the bituminous and anthracite coal mines which it owns along the route. J. A. Kebler, of Denver, is General Manager, and T. H. Wigglesworth, of Carbondale, Col., is Chief Engineer.

Detroit Belt Line.—The company was chartered in Michigan last week with a capital stock of $2,000,000.

Fairmont, Morgantown & Pittsburgh.—Work all along the extension from Morgantown, W. Va., north to Smithfield, Pa., is being pushed forward rapidly, especially between the Cheat river bridge and Smithfield, Pa. The bridge piers are well up beyond the ordinary stages of the water. Along Grassy Run near the State line 800 men are at work. This part of the line will be very heavy, the cuts and fills being deep and there being six bridges of from 40 to 70 ft. span. The work on the upper tunnel is also being pushed vigorously.

Fitchburg.—The company is making good progress on the construction of the second track on its Watertown branch. The grading is well advanced between West Cambridge and Watertown, Mass., and much of the masonry work, in the way of culverts and the widening of the overhead bridges is also finished. A large force of men is at work and the construction will be pushed as rapidly as possible right through the winter.

Helena & Southern Montana.—The charter of this company was filed in Montana last week, the company proposing to build a road from Helena to Dillon, the Southern terminus, and Virginia City in Canyon County. The road will cross the Missouri River at Canyon's Ferry, near Helena, and extend up the Missouri valley to Townsend, and along Crow Creek, North Boulder Valley, down Jefferson River Valley to Twin Bridges, and thence up Beaverhead Valley to Dillon. The incorporators are A. M. Holter, Samuel Wood, Henry Elling, Benjamin F. White, S. T. Hauser, A. J. Seligman and L. H. Hershfield, of Helena, Mont.

Interoceanic.—A newspaper report from Monterey, Mex., says that Delfin Sanchez, who is largely interested in this road, has arrived at Monterey, from an extended visit in Paris and London. He states that while in London he was successful in securing the capital necessary for the construction of the extension of this road from Pueblo to Acapulco, on the Pacific Coast. This division has been completed for 30 miles beyond Matamoras.

La Porte, Houston & Northern.—The grading has been finished on the first division from Trinity Bay to Harrisburg, Tex., except the last mile at the latter town. Rainy weather has delayed the work, but the tracklaying will probably soon begin on the 12 miles of graded road.

Mexico, Cuernavaca & Pacific.—It is expected to open the first 18 miles of this road from the City of Mexico southwest to Contreras on Dec. 12. The road has been finished for 12 miles at present, and the next six miles will be completed before the rolling stock is received. The road is being built largely by Denver capitalists, and a number of the large stockholders, including George Tritch, President of the company, Philip Zang, President of the construction company and H. Sturm, General Manager will leave Denver shortly for a trip over the new road.

Middle Georgia & Atlantic.—It was announced at Savannah, last week that a syndicate loan of $150,000 had been completed by the Seaboard Co., of Savannah, the construction company, for the completion of the 20 miles of road from Eatonton to Covington. A meeting of the stockholders will be held on Nov. 12 to complete the arrangements.

Missouri, Kansas & Eastern.—John S. Elliott, one of the contractors on this road, which is being built by the Missouri, Kansas & Texas, from Franklin to St. Louis, says that the road will probably be completed in January. He describes the route as starting in Howard County, Mo., and traversing the Missouri Valley until it reaches St. Charles, Mo. It crosses the Missouri River at St. Charles over the Wabash bridge and runs in a traight line to St. Louis. The road will supplant the steamboat business of the Missouri River, as it follows the river from 15 miles above Rocheport, Mo., to near the mouth at St. Charles. For years past steamboats have not been able to go up the Missouri River over two months in the year on account of the shallow water.

Missouri, Kansas & Texas.—Burkitt, Burns & Murphy, who are building the branch into Houston, state that the line from Boggy Tank to Sealey, a distance of 27 miles, is graded and 13 miles of track is laid. The line will be finished to Sealy in 10 or 12 days. The road is also graded east of Sealy to the Brazos River. Grading outfits are scattered along the route to within 25 miles of Houston. Work will begin at once on the bridges in Houston when the line crosses White Oak bayou.

New Iberia & Vermillion.—A report from Abbeville, La., states that the grading from New Iberia to Abbeville has been completed this week, excepting the station site. The construction gang is now 12 miles from Abbeville and is expected to reach the town within two weeks. The road will be completed to Abbeville in time to carry the season's sugar and cotton crop to market.

New Roads.—Joseph R. Roy, C. E., has just finished a survey for a road between St. Felix de Valois and St. Jean de Martha (north of Berthier, Que.). He is about to begin surveys for a line between St. Lin and Joliette, Que. It is intended to carry the first line as far as St. Emile. When built, these roads are likely to be operated by the Canadian Pacific.

Northern Central.—The grading is now being done for the extension of the double track, 2 6-10 miles to Goldsboro, Pa., on the Baltimore division of the work being under contract to Patrick Reddington. The second track work has been completed this year for 4 9-10 miles on the Susquehanna division between Mahantango and Georgetown, Pa., and the section was opened on Oct. 10. This work was done by the railroad company's forces.

North Louisiana & Arkansas.—Grading has been completed on the short line which this company, James Bussey, President, is building in pursuance of its agreement with the New Orleans & Northwestern, and tracklaying is to begin at once. The line extends from Bastrop to Collins, La.

Ohio River.—This company has completed its independent line into Huntington, W. Va., and is now using its own station and terminal facilities at that town. The first train was started out of the new station last Sunday.

Olean, Oswayo & Eastern.—This company has been granted a charter in Pennsylvania to build a road from the village of Genesee Forks to the village of Oswayo, Potter County, Pa., 14 miles. The capital stock is $200,000. J. B. Rumsey, Columbus, O. is President.

Ottawa & Gatineau Valley.—The second section between Kazubasua and Farrelton, Que., is expected to be ready for inspection by Nov. 15. The grading on this portion of the road is completed and tracklaying is now being carried on. The remaining portion of the road to Le Desert, Que., may be commenced early next spring.

Pennsylvania.—Contractors Covode & Malone have commenced work on the double track branch road, one mile in length, which will extend from the Germantown and Chestnut Hill branch of the Pennsylvania to the Midvale Steel Works at Nicetown, Pa.

Philadelphia & Reading.—About 300 men are now employed on the construction of the two connecting branches being built by this company near Philadelphia. These lines are the Philadelphia & Newton Connecting and the Philadelphia & Frankford road. The former extends from a connection with the Tabor Branch at Tabor Station, to Olney Station on the Philadelphia, Newtown & New York road, and is one and one-tenth miles long. The Philadelphia & Frankford extends from Crescentville Station on the Philadelphia, Newtown & New York to Frankford, Pa., and is two and seven-tenths miles long. The work upon these lines will be finished about March 1, 1893.

Pittsburgh, Cincinnati, Chicago & St. Louis.—The extension of the New Cumberland (W. Va.) branch of this road is progressing slowly, and is not making the headway that was hoped for. The grading is all completed as far as Mahan's, and is progressing with fair rapidity above the point. The pile driving and culvert work are the cause of the delay. No rails have been laid as yet, but the engineers are driving the centre stakes preparatory to commencing track laying. A heavy girder bridge which has done service on the main line at Noblestown, O., for 11 years, and which has recently been replaced by a new stone bridge, will be erected over Tomlinson's run on the new branch, which will be five miles long from New Cumberland, W. Va., to a point opposite East Liverpool, O.

Pittsburgh & Western.—The second track between Zelienople and McKimms, Pa., 8.6 miles, was opened for traffic on Oct. 5, as already reported. All this work has been done by the company's construction department. By Dec. 1 next the company will open 2.7 miles of double track between Callery Junction and Evans City, Pa. This piece of road is built entirely independent of the present main line and is constructed by M. J. Degnon, of Cleveland, contractor. About the same time the 3.4 miles of double track will be completed between Moravia and Newcastle Junction, which is being built by the construction department. The double tracking of tunnel No. 1 is progressing rapidly; also the two miles from tunnel No. 1 to Witmnr, and if nothing unforeseen happens this will be done by Dec. 10. M. J. A. Ranson, of Pittsburgh, is doing the double tracking of the tunnel, also all rock excavations. The grading is done by the construction department.

Roanoke, Fincastle & Clifton Forge.—A survey is now being made for a line from Fincastle, Va., to connect with the Chesapeake & Ohio, which will be about 12 miles long. The survey will be completed in about 10 days, and the company then expects to complete the grading on the entire road from Roanoke to the Chesapeake & Ohio. This work is partly done between Fincastle and Cloverdale.

Sioux Falls Western.—The contracts for grading this road west of Sioux Falls toward Yankton, So. Dak. were let last week by Senator R. F. Pettigrew, of Sioux Falls, the principal local projector. The contract for the first 10 miles from Sioux Falls south was let to Alfred Jones; the next 10 miles in Yankton County to J. D. McDonald; and 10 miles in Tanner County to Joseph Sampson. The citizens of Yankton will be asked to grade 15 miles of road east of that town to connect with the line now under contract.

Southern Pacific.—Contracts have been let for the heavy mountain work on the line from Santa Margarita south to San Ellwood, and the contractors have commenced the construction work. This line is to be 128 miles long, south to and through San Luis Obispo, and along the coast to Ellwood on the Ventura division, and will give the company a second line between Los Angeles and San Francisco. The contract was let to George

Stone & Co., of San Francisco, for the first 16 miles from Santa Margarita south to San Luis Obispo on Oct. 18. This is the heaviest work, and involves an outlay of $1,500 000. Mr. Stone and his partner, J. A. McMurtrie, formerly Chief Engineer of the Denver & Rio Grande for 13 years, and in charge of its heavy construction work, are establishing their camps. In the 16 miles between Santa Margarita and San Luis Obispo there is 8,000 ft. of tunnel work, distributed over seven tunnels, through solid rock. The largest tunnel, at the summit of the Coast range, will be 3,600 ft. long, and commences three miles south of Santa Margarita. It is for this heavy tunneling that the outlay will be required. When the tunnels are finished, the remaining 112 miles will be easily and rapidly finished, so that nothing will be done on the part of the work until the drilling of the mountains is nearly completed. It is estimated that about 15 months will be required to carry out the contract. In the whole 16 miles there are no bridges, and the culverts have been put in by the railroad. As the road is to be used for overland travel it will be constructed substantially, and 70-lb. rails will be used. The advantages of the line will be to save the run over the Tehachapi pass and over the hot San Joaquin valley. The bulk of the freight and local travel will be over the two lines which now run down the valley. Monterey, Paso Robles and other points will all be reached directly on this line.

South Florida.—New surveys have recently been made for the extension to High Springs, Fla. The right of way agents have been at work for some time and have secured most of the right of way north of Inverness to near High Springs. The section of country through which the road will extend is heavily timbered and has numerous phosphate beds. The construction of the road will soon begin at High Springs and be prosecuted with vigor in order to complete it to accommodate those who propose to develop the timbered and phosphate interests of that section. The contracts will be let during the winter.

Tennessee Midland.—The route of the proposed Nashville extension has been located from Perryville, Tenn., via Linden, Perry County, and Centerville, Tenn., to Nashville, but this location will be revised. The early construction of the road is dependent on the success of the Davidson County subsidy voted on this week. The maximum grade is 52.8 ft. a mile, and the maximum curvature 4 deg. Three iron bridges, one across the Tennessee river, one across Wolf and one across Buffalo rivers, and two tunnels 500 ft. long each, will be required.

Texas, Louisiana & Eastern.—James A. Smyth, Secretary of the road, reports that 18 miles of track has been laid east from Conroe, Tex., which brings the line within four miles of Cleveland, where it will connect with the Houston East & West Texas road. It will probably be a month before the track on this four miles is laid. The line has been surveyed east to the Trinity River.

Texas & Sabine Valley.—The recent organization of this company in Texas is explained as follows: Owing to the state laws the right of the Texas, Sabine Valley & Northwestern to extend beyond its present terminus at Carthage, Tex., had expired, and its owners, being desirous to build further, were obliged to organize a new company for the purpose and get a new charter. This is the origin of the above named road, which is to build from Carthage through Tenaka on the Houston, East & West Texas to Center, the county seat of Shelby County, 10 miles south of Tenaka and about 30 miles from Carthage. But two miles has been located to be built this year, but it is hoped that construction will be continued next year to Center. Richard J. Evans, Longview, Tex., is General Manager.

Toledo, Walhonding Valley & Ohio.—The tracklaying was practically completed this month over the entire road to Loudonville, O., where connection is made with the Ft. Wayne division of the Pennsylvania. The length of the road is 42 miles and it extends from Coshocton to Loudonville, connecting at both points with the Pennsylvania, by which the new line will be operated. The ballasting is now being done, McArthur Brothers, of Chicago, being the contractors for that work as well as the tracklaying.

Wilmington, Onslow & East Carolina.—Grading is about finished on the 30 mile extension of the road from Jacksonville northeast to New Berne, N. C., which is being built by the East Carolina Railway & Land Co.

Yakima & Pacific Coast.—The tracklaying on this branch of the Northern Pacific is now within a short distance of the western terminus on the Pacific Coast, and about a mile of track is laid each day. Some delay will probably be encountered at the South Fork, three miles east of South Bend, Wash., on account of the noncompletion of the drawbridge there.

GENERAL RAILROAD NEWS.

Alleghany & Kinzua.—The New York Supreme Court has dismissed the action brought by James R. O'Beirne and others, as bondholders of the road, against Spencer S. Bullis, of Olean, N. Y., and others to compel the performance of a contract whereby 30,000 acres of timber lands were to be included in the property securing the company's bonds.

Atlantic Coast Line.—The through express trains of the Atlantic Coast Line, during the coming winter season, will be run by way of the Wilson & Fayetteville Cut-off, thereby effecting a saving of 61 miles in the through line. The service on this route between northern cities and Jacksonville, St. Augustine, Tampa, Havana and the other winter tourist points in Florida and Georgia, which has for a number of years been most excellent, will be still further improved both in point of time and equipment. It is expected that three fast express trains will be run daily during the season upon much faster schedule than heretofore.—*Official Guide.*

Boston & Maine.—The directors have approved quite extensive plans for alterations in the terminal facilities at Boston, which, when carried out, will materially relieve the pressure on the streets in the vicinity of the several stations. It will be remembered that the tracks leading from the passenger station at Haymarket square cross Causeway street, at grade, and that this street is used by carriages and wagons going to the passenger station of the Eastern Division of the road as well as to the freight houses and stations of other roads. The plan, in general, provides for the removal of freight houses and the construction of additional tracks for passenger trains at the station of the Eastern Division. Six freight houses, about 60 x 100 ft., will be built on Rutherford avenue, Charlestown, to accommodate the freight business now done in the buildings to be demolished. There is ample trackroom at Charlestown, and the freight houses will be begun at once. The scheme contemplates the entire abolition of freight houses in the city proper. The number of tracks to be laid for passenger trains is 13. On Causeway street, east of the present passenger station of the Eastern Division a new headhouse is to be built, containing a large waiting-room, and there will be a separate building for baggage, 40 x 100 ft. The space occupied by the freight houses on Canal street will be used for an additional platform for inward passenger trains of the Western Division. It is stated that the new headhouse will be built of brick and have all modern improvements, but the people of Boston are in doubt whether to look upon this as a favorable circumstance, as they have been hoping for several years that the Boston & Maine would build one new large station to accommodate the passenger business for all three of its lines, which enter the city at practically the same point. It will be remembered that Mr. Thomas Doane, under the direction of the State Railroad Commissioners, prepared an elaborate plan for such a station, to include facilities for the Fitchburg road also last January. Mr. Doane's plan provides for a new station on land now occupied by dwelling houses one or two blocks west of the present stations. The improvements now contemplated seem to have no relation to his plan.

Davenport, Iowa & Dako'a.—The foreclosure sale of this road was noted last week. The road was bid in by the Burlington, Cedar Rapids & Northern for the amount of the decree, $630,000. That company has been operating the road, which is 31 miles long, extending from Davenport to Bennett, Iowa. The roadbed has been partly graded to Elma. The company was organized some five years ago as a local line by business men of Davenport, to build an independent line to the north and west. The Burlington, Cedar Rapids & Northern secured control of the bonds about 15 months ago.

Louisville Southern.—The Providence Life & Trust Co., of Philadelphia, has filed suit in the United States Court, at Louisville, against the County of Mercer. Several years ago Mercer County voted $125,000 to aid in the construction of the road. The payment of the bonds has since been repudiated, and the suit is brought by the holders to recover value of the same.

Manhattan (Elevated).—The following statistics are from the annual report for the year ending Sept. 30:

	1892.	1891	Inc.
Passengers carried	208,276,681	199,327,941	8,942,740
Suburban branch	6,851,894	1,417,777	5,434,117
Total	215,122,575	200,745,718	14,376,857
Gross earn	$10,908,578	$10,174,935	$733,643
Oper. expen	5,964,888	5,608,029	356,860
Net earn	$4,943,690	$4,566,906	$376 783
Fixed charges	1,963,743	1,916,080	47,663
Balance	$2,979,946	$2,650,826	$329,120
On stock	9.93%	8.83%	1.10%
6% dividend	1,800.000	1,680,000	120 000
Surplus	$1,179,946	$970,826	$209.120

New York & New England.—The Massachusetts Supreme Court has been asked to enjoin the road from leasing the Meriden, Waterbury & Connecticut road. They claim that the proposed lease is not authorized by law, and that it has not been authorized by the stockholders of either road. Under the terms of the proposed lease the New England road agrees to pay $22,500 yearly rental for the Meriden line.

Oregon Pacific.—The time having expired for completing the purchase of this road, made a few months ago, the Court in Oregon having jurisdiction in the litigation, has ordered a new sale at the expiration of 30 days, unless in the meantime the former purchasers pay into the court the sum bid, $1,000,000.

TRAFFIC.

Traffic Notes.

A Western paper states that the Queen & Crescent system has annulled its order forbidding stopovers. This road was, we believe, one of the first to abolish the stopover privilege.

The Columbus, Hocking Valley & Toledo and the Columbus, Shawnee & Hocking roads have given notice, to take effect Dec. 31, of withdrawal from the Ohio Coal Traffic Association.

During the month of October 125,322 cars passed through the yard of the Pennsylvania road at Columbia, 80 miles west of Philadelphia. The number of trains was about 100 a day, and the total movement was about 10 per cent. greater than ever before.

Chicago Traffic Matters.

CHICAGO, Nov. 9, 1892.

The discussion of proposed rates for the World's Fair at the November meeting of the Western Passenger Association was entirely harmonious. A conference was held between all the members of the association and the Chicago & Alton, at which the sentiment was unanimously in favor of the making of a round-trip rate of one fare and a third and single trip rate at one-half the round trip fare, plus a slight advance, but not sufficient to render it profitable for the scalpers to manipulate the round trip tickets. The whole matter was referred to a committee of seven.

Thirty-four representative lines have joined in inviting all passenger and ticket agents to a general meeting at the Auditorium hotel, this city, Nov. 21, "to give full consideration to the important question of a proper handling of this (World's Columbian Exposition) traffic in all respects, and to learn the wishes of the people and the possible necessities of the situation in the different sections of country." The Illinois Central will extend the courtesy of a special train to the grounds and return on the afternoon of that day.

In connection with proposed rates for the Fair, an absurd report has gained currency in the newspapers that the roads would seek to classify the passengers traveling on excursion tickets, thereby depriving them of sleeping car privileges at the reduced rate. No such action is contemplated. The report probably grew out of the fact that the trunk lines will continue their present rule of not accepting excursion tickets on certain (limited) trains. Some of the roads are in favor, however, of setting apart certain days on which rates much lower than the agreed rates shall be made, and making this class of tickets good only in ordinary first-class coaches—not running any sleeping cars on these trains.

Chairman Midgley has ordered the cancellation on Dec. 15 of all tariffs from Gulf ports on foreign and domestic traffic destined to territory west and northwest from St. Louis, not duly approved by the association. Exception is made of rates on tin plate, earthenware and salt to Missouri River points on account of authority having been given certain lines from North Atlantic seaports to use reduced proportions west of the Mississippi River on these commodities in competition with like shipments via Gulf ports. In making the order, the chairman calls attention to the fact that repeated efforts have been made for the past two years, without success, to secure a conference between a committee of the Western Freight Association and the New Orleans Traffic Association to examine rates which have from time to time been issued on this traffic. On account of the indisposition shown to ameliorate the conditions arising, certain roads in the association have been authorized to join Eastern connections in through rates on import traffic from North Atlantic seaboard ports that would enable the northerly route to compete by allowing roads west of the Mississippi proportions in excess of the divisions received west of St. Louis on current shipments via New Orleans. In regard to domestic shipments, he says the situation has been steadily growing worse, until now in some cases rates are less from New Orleans to western points than from Chicago, though the mileage from Chicago is less than half that from New Orleans. He further states that there can be no justification for the present absurd adjustment which has been forced upon the roads in the Western Freight Association against their will, and which has been submitted to long and patiently in the hope that a conference could be had for the purpose of withdrawing or advancing the rates by agreement. In making the order for the strict enforcement of local rates on this traffic from all gateways of the association, the chairman states that the date effective has purposely been made some time in advance, in order that reasonable time may be allowed for a conference if the New Orleans roads now are disposed to join one.

Some of the connections of the Western Passenger Association have objected strongly to the date for the advance in rates between Missouri River points and Chicago and St. Louis, and St. Louis and Chicago, claiming that it will not be possible for them to get their tariffs corrected before Nov. 15. They appealed to the association for a postponement until Nov. 15, but the association declined to grant it.

The lines in the Wisconsin committee of the Western Freight Association have agreed that the payment of switching for delivery of lumber in Chicago beyond their own rails should be borne by shippers, and that from Nov. 10, all joint through rating from points on Wisconsin lines to Chicago suburban stations on foreign lines will be discontinued and shipments will be billed locally to Chicago; but the lines affected are at liberty to absorb necessary switching to equalize competitive delivery. The Wisconsin Central refused to agree to this and the other lines voted to ignore that line, except on shipments originating at competitive points on its line, on which switching may be absorbed. The Chicago, Milwaukee & St. Paul joined the agreement with the privilege of withdrawing by giving 30 days notice.

It is announced that the movement to establish an interchangeable 5,000-mile ticket has been abandoned for the present, because, it is said, no plan has yet been found which will result in a satisfactory division of the revenue.

Shippers here are asking the roads to keep their freight houses open until 5:30 P. M., instead of 4:00 P. M., as is now the rule.

As was intimated in my letter sent at the time the western lines were at work endeavoring to form a "side agreement" to maintain rates pending the re-organization of the existing associations, or the formation of a new association to take the place of the Western Traffic, the agreement adopted at that time to strictly maintain rates after Sept. 21 between Chicago and St. Louis and the Missouri River has already collapsed. On Oct. 26 the Kansas City, Ft. Scott & Memphis notified Chairman Midgley that rates were being made from New York to the Missouri River of 85 cents on first-class, 75 on second and 60 on third, and that therefore the K. C., F. S. & M. refused to make any advance; and at the same time permission was asked to make such rates via Savannah and Memphis as would meet this competition. Chairman Midgley ruled that there was no authority vested in the association to allow the making of indefinite rates and that the Ft. Scott road must file a schedule of the rates it wished to make. The road now announces that it will ask consideration of the request at the next meeting. This probably means that the competition will be met whether the authority is granted or not. Following this action of the Ft. Scott, the Chicago, Milwaukee & St. Paul has given notice of its withdrawal from the agreement. The notice says that it is "evident that the agreement by which rates were to be strictly maintained after Sept. 21 is not being maintained, and that especially from the seaboard territory two or more lines are, and have been ever since Sept. 21, engaged in cutting rates."

The Atchison, Topeka & Santa Fe announces that the new California limited train which was announced to commence running Nov. 15 will not be put on for the present. The idea has not been given up, but unforeseen obstacles delay its inception for the present.

The shipments of eastbound freight, not including live stock, from Chicago by all the lines for the week ending Nov. 5 amounted to 74,589 tons, against 81,046 tons during the preceding week, a decrease of 6,477 tons, and against 58,285 tons during the corresponding week of 1891. The proportions carried by each road were:

Roads.	W'k to Nov. 5.		W'k to Oct. 29.	
	Tons.	P. c.	Tons.	P. c.
Michigan Central	11,708	1.57	14,928	18.4
Wabash	3,280	4.4	4,021	5.0
Lake Shore & Michigan South.	15,052	2.02	13,541	16 7
Pitts., Ft. Wayne & Chicago	8,989	12.1	8,674	10.7
Pitts., Cin., Chicago & St. Louis	9,532	12 8	10,978	13.5
Baltimore & Ohio	3,423	4.6	3,292	4.1
Chicago & Grand Trunk	5,177	6.9	5,630	7 0
New York, Chic. & St. Louis	6,781	9.1	6,015	7.4
Chicago & Erie	7,587	10.2	10,759	13.3
C., C., C. & St. Louis	3,050	4.0	3,198	3.9
Total	74,589	100.0	81,046	100.0

Of the above shipments, 2,641 tons were flour, 31,250 tons grain and millstuff, 12,009 tons cured meats, 12,105 tons dressed beef, 1,039 tons butter, 2,968 tons hides and 8,284 tons lumber. The three Vanderbilt lines carried 45 per cent., the two Pennsylvania lines 24.9 per cent. The lake lines carried 82,447 tons, against 81,947 tons during the preceding week, an increase of 500 tons.

Date.				H. P.
1.	Philadelphia & Reading Terminal R. R.	12th order,	Philadelphia, Pa.	85-Comp.
1.	" "	13th "	" "	85 "
1.	" "	14th "	" "	85 "
1.	" "	15th "	" "	85 "
1.	" "	16th "	" "	85 "
1.	Pittsburg *Chronicle Telegraph*	3d "	Pittsburgh, Pa.	60-Stan.
3.	West Michican Furniture Co.		Holland, Mich.	25-Jun.
3.	H. Mueller Plumbing Co.		Decatur, Ill	35 "
4.	F. J. Parson's & Co.		Nineveh June., N. Y.	15 "
4.	Cochrane Chemical Co.	3d "	Boston, Mass	35-Stan.
5.	Cresent Steel Co.	6th "	Pittsburgh, Pa.	75-Jun.
5.	Pennsylvania Tube Works		" "	75 "
5.	Dawson Electric Light and Power Co	1st "	Dawson, Pa	75 "
5.	" " "	2d "	" "	75 "
5.	" " "	3d "	" "	35 "
5.	Nicaragua Engineering Co.		Managua, Nic.	10 "
5.	Adam Blumer		Monroe, Wis.	25-Stan.
5.	Bridgeport Copper Co (kodak)	6th	Bridgeport, Conn.	100-Comp.
7.	Westinghouse El. & Mfg. Co	35th "	Pittsburgh, Pa.	330 "
7.	" " "	36th "	" "	130 "
7.	Wm. Clark Thread Co.		Westerly, R. I.	10 Stan.
7.	United Gas Imp. Co.	25th "	Philadelphia, Pa.	75 "
7.	H. J. Russell		Tekoa, Wash.	50 Jun
7.	Evanston El. Ill. Co	5th "	Evanston, Ill.	100 Comp.
7.	J. E. Reinecker		Chemnitz, Ger	85 "
7.	Yuan Boyer		Ygualade, Spain	45 "
7.	Yg. Y. Bertran		San Felice	65 "
7.	Jose Selderila Casas		Balsareny	85 "
7.	Jose Tobra		Castelli	200 "
8.	Rourke, Stroub & Co		Knoxville, Tenn.	35 Jun.
10.	Pittsbugh Reduction Co.	5th "	Kensington, Pa.	330 Comp.
10.	" "	6th "	" "	330 "
10.	Detroit Citizens' Street Railway Co		Detroit, Mich.	260 "
11.	Montgomery Street Railway		Montgomery, Ala.	130 "
11.	Columbian Exposition	5th "	Chicago, Ill	130 "
11.	" "	6th "	" "	130 "
11.	Odd Fellows Hall	1st "	Philadelphia, Pa.	85 "
11.	" "	2d "	" "	85 "
11.	" "	3d "	" "	85 "
11.	First National Bank Building	1st "	Pittsburgh, Pa.	45-Stan.
11.	" "	2d "	" "	45 "
13.	Tacony Iron and Metal Co.	1st "	Tacony, Pa.	25 "
14.	S. D. Warren & Co	26th "	Yarmouthville, Me.	85-Comp.
14.	W. G. Wildermuth		Pomeroy, O.	5 Jun.
14.	F. Glazier & Son	2d "	So. Glastonbury, Conn.	25 "
15.	Union Hardware Co		Torrington, Conn.	100-Comp.
17.	Johnstown Pass. Railway Co., (kodak.)		Johnstown, Pa.	330 "
17.	Rust & Mason	2d "	Forest Mills, Minn.	65 "
17.	Shaw Stocking Co		Lowell, Mass.	10-Jun.
17.	Kalamazoo Paper Co.	2d "	Kalamazoo, Mich.	75 "
17.	Unknown		Moscow, Russia.	35 "
17.	"		" "	25 "
17.	"		" "	15 "
17.	Unknown		Moscow, Russia.	35 Stan.
17.	"		" "	25 "
17.	"		" "	15 "
18.	O. B. Shallenberger		Rochester, Pa.	15 "
18.	Irvin Van Wie	9th order,	Syracuse, N. Y.	15 "
18.	R. D. Nuttall & Co.	2d "	Allegheny, Pa.	15-Jun.

Date				H. P.
20.	Fontaine Crossing Co.	8th order,	Detroit, Mich.	5-Jun.
20.	Roberto Law	4th "	Monterey, Mexico	5-Stan.
22.	Standard Oil Co.	3d "	Bayonne, N. J.	35 "
22.	Hoyle, Harrison & Kaye		Philadelphia, Pa.	25 "
22.	Alexander McLaren		Osceola, Ont.	50 Jun.
24.	E. B. Hilman & Co.		Kahoka, Mo	50 "
25.	Spreckels Sugar Refinery	64th "	Philadelphia, Pa.	75-Stan.
25.	" " "	65th "	" "	100 "
25.	" " "	66th "	" "	100 "
25.	" " "	67th "	" "	100 "
25.	" " "	68th "	" "	100 "
25.	Otis Falls Pulp Co.	2 "	Otis Falls, Me	5 "
25.	Charleston Gas and Electric Light Co	2d "	Charleston, W. Va.	330-Comp.
25.	Robert Mitchell Furniture Co.		Cincinnati, Ohio	50-Jun.
26.	Long & Marvin		Glenville, Minn.	32 "
26.	William Knight		Chicago, Ill.	35-Stan.
26.	Tacony Iron and Metal Co.	2d "	Tacony, Pa.	10 "
26.	Justice, Bateman & Co.	2d "	Philadelphia, Pa.	15 "
27.	Moore, Arms & Thompson		Bellows Falls, Vt	75 "
28.	Balt. Elect. Refin. Co	5th (kodak)	Baltimore, Md.	100-Comp.
29.	Balt. Traction Co.	(kodak.)	" "	260 "
29.	Penoles Mining Co.		Mapimi, Mex	10-Jun.
29.	Ott, Mergenthaler & Co.		Baltimore, Md.	50 "
31.	Globe Furniture Co.		Northville, Mich.	75 "
31.	Cobannett Mills		Taunton, Mass.	5-Stan.
31.	Gaiety Bijou Theatre		Boston, Mass.	5 "
31.	Niag. Falls Paper Co.		Niagara Falls, N. Y.	25 "
31.	Waters-Pierce Oil Co		St. Louis, Mo.	50-Jun.
31.	Columbian Exposition	7th order,	Chicago, Ill.	330-Comp.
31.	" "	8th "	" "	330 "
31.	Unknown		St. Louis, Mo.	50-Jun.
31.	Wes inghouse Machine Co.	10th "	Pittsburgh, Pa.	25 "
31.	Kahn, Lang & Co.		Espinall, France	65-Comp.
31.	Monongahela Furnaces	1st "	McKeesport, Pa	5-Stan.
31.	" "	2d "	" "	5 "
31.	Carnegie Steel Co.	16th "	Pittsburgh, Pa	5 "
31.	Allegheny Co. Lt. Co	54th "	" "	5 "
31.	" "	55th "	" "	5 "
31.	Otis Falls Pulp Co.	3d "	Otis Falls, Me.	5 "

SUMMARY.

33 Compound Engines, aggregating	-	5,185 H. P.
35 Standard " "	-	1,180 "
30 Junior " "	-	1,160 "
TOTAL, 98 ENGINES, aggregating	-	7,525 H. P.

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1 " ..... 40 "

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